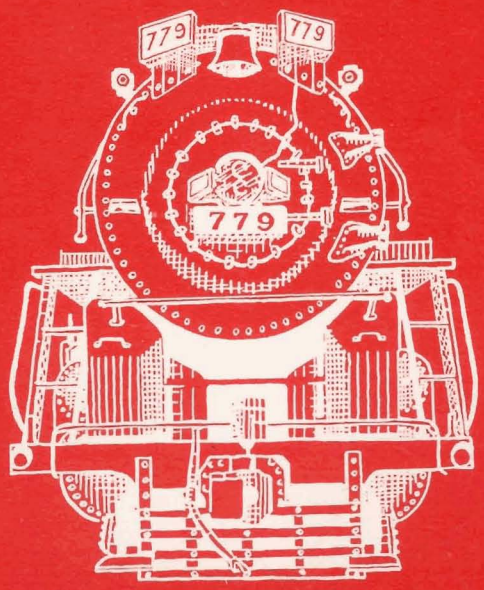
When Superdetailing Must Be The Very Finest

"In True Scale"

Go

S Scale



Locomotive & Supply

Join The Gauge Of Craftsmen

FOUNDER NATIONAL ASSOCIATION OF S GAUGERS UNITED #00

CASTINGS-WHEELS-DRIVERS THIS PRODUCT CONFORMS TO ALL APPLICABLE NMRA STANDARDS WARRANT 89

A PERSONAL MESSAGE

We, at "S" Scale Locomotive and Supply, wish to take this opportunity to thank each and every one of you, personally, for your wonderful patronage and your orders during the past years. It is with a sense of great, justifiable pride that we tell you of the many letters we have received concerning our materials, stating that they are of the highest quality in the trade - the principal reason for "S" gauge very rapidly regaining its rightful place, with new S gaugers everyday. We are extremely appreciative of your friendship and your many complimentary and "keep it up" letters.

On our part, we shall continue to especially design our castings and other parts to provide you with the best detailed, finest quality equipment in any gauge, while continuing to keep our prices as low as possible. We trust that our "helpful information" and the remarkable castings will give you more building pleasure than ever. With your continued help with further patterns, we expect, ultimately, to be able to give you such a variety of available parts that you may build almost any engine.

Again, with sincere thanks, we remain,

314-383-4132

Very truly yours,

"S SCALE LOCOMOTIVE AND SUPPLY"

You have chosen a good clean hobby at home, one that you would be proud to have your children follow and one that you can work on any time the desire strikes. It isn't necessary to wait for certain dates, times or places (possibly at quite a distance) to enjoy it.

Model railroading is unique in that it's scope is so broad that almost anyone can find a phase of work that is particularly pleasing - Building of engines, cars, roadbed, scenery and structures; Painting of engines, cars, scenery and structures, plus the addition of ageing, lettering, etc. for various periods; Scenery gives unlimited challenge to the imagination as to what can be devised and the effects accomplished; Electrical is also unlimited in the range from simple wiring for the novice to complicated, fully automatic operation and the effects of electronics and relay racks; Contests are available through the national and regional (local) NMRA conventions for all of the above phases, except electrical. The national conventions give you the opportunity to travel to different parts of the country each year, meet new and hospitable friends and see other layouts.

In the long run, the cost of model railroading is probably less than many other hobbies or pastimes as equipment is accumulative and can be used for a lifetime. Too, much of the cost can be recovered if you ever leave the hobby. Many hobbies or pastimes give pleasure for a couple of hours or days and are then forgotten, ordinarily with little economic return. Thus, over the years, they are very costly.

S GAUGE

We in S gauge feel that our's is a perfect gauge. While we cannot give you a layout on a hat brim or cars that you can ride, we can give you an "in-between" size, large enough to be more trouble-free than the miniatures but not so small as to lose the attractive, realistic detail that you as a modeller demands. The miniatures cannot give you the detail, and oddly enough, the larger gauges do not give as much detail as S gauge. As you will see throughout this catalog, "S" is the "superdetailed" or craftsman gauge and not the toy or tinplate gauge that you may have been led to believe. Our cars, engines and parts are almost perfect scale.

While it is true that S gaugers are in a minority, we're confident that this is a "temporary" condition with the addition of new products, more suppliers and many hobbyists converting to "S". There is little "junk" in the S hobby equipment now available.

OUR CASTINGS

All parts listed here are American-made brass castings unless otherwise noted. Many castings have more detail than the drawings can show. If at all possible, our castings will show all the prototypical detail (you may have to use a magnifying glass to see some of it).

Some gauges have more parts than ours, but lack many of the critical items (wheels, drivers, frames, etc.) that few modellers can make. Without these parts, they cannot construct a single, complete engine. It is our policy and belief that all parts be made to complete a single, super-detailed model of a prototype, rather than making random, unrelated parts. We did this on our first locomotives - the Nickel Plate, Chesapeake & Ohio and Pere Marquette Berkshires (2-8-4). These will be followed by the USRA engines listed below: light and heavy Mikes (2-8-2), light and heavy Pacifics (4-6-2) and light and heavy Mountains (4-8-2). These locomotives may be used "as is" for the period during and just after WWI, as a basic engine to be modified for a particular road, layout or period, and freelanced to suit your personal tastes.

The straight USRA engine (if there is such a thing) can be used to make many different locomotives by simply changing a headlight, a truck on engine or tender, several pieces of piping, a dome or stack, pilot, bell, etc.

We expect to continue this system of providing new parts via new engines, until ultimately (with your help in contributing new patterns), you can build practically any engine. There seems to be a message here - learn to build engines, so that you can take advantage of this flexibility and variety of locomotives at a fraction of the cost of ready-to-run units.

Each part is common to a great many engines (not just the above) and many are used on all locomotives. They can also be used to upgrade American Flyer engines. After mating parts have been cleaned, they may be attached by soldering, with screws or epoxy (see "Epoxying Instructions").

Instructions will not be sent with each part, including Trucks, Boilers, Valve Gears etc. Instead a seperate printed catalog is available (below cost) for 25¢ and 5¢ postage, AS A MUST for the very first part ordered. It will be included with complete Engine kit, plus another catalog of additional instructions particular to that Engine.

See #260.1, p-11

THIS CATALOG

To aid you in building your locomotives, the parts numbers are listed in the most general building order, with the exception of a few similar parts which do not have the same location on all engines. This should be of great assistance to the novice. The catalog also lists the parts in engine section order, starting with the Running Gear (all below the Boiler), Boiler and Boiler Parts, Boiler Front Parts, and Tender. Accessory parts for each section are also listed.

We did not think scale drawings necessary as all parts are true S scale, 3/16" equals a foot or 1/64th of the prototype dimensions. To save space, we have used the smallest indication that would still show the detail. We have given dimensions to parts that vary in size, such as domes and smoke stacks.

The listing of unpriced parts means that they are being made now or at a later date, as time permits, or as you make the patterns. Do not order unpriced parts at this time. Announcements will be made in our "S Gauge Herald" ad or price supplements.

To keep the catalog from being obsolete for the longest possible time, the center columns have been left blank. Permanent pictured supplements of new parts will be made available (at cost) for attachment near their corresponding numbers. Until the permanent supplements are received, the blank space may be used for pencil orders, notes and new introductions from our "Herald" ad.

PARTS CODES

To help you further, we have used a number-letter code to show what parts go with some of the most popular engines. Parts common to most locomotives are omitted. It would be impossible to list all popular engines, let alone the thousands that were built. To list all engines per part would make the catalog twice as large and expensive, hence the letter code. Our listing will not be 100% correct as we don't have large plans of all these engines to check every dimension. Thus, our code will be derived from magazine-sized pictures, plans, measurements and parts that we feel can be used or modified. Possibly you will never get a particular part ready-made. For example, there are many styles of Walschaerts Valve Gear Frames; Main and Side Rods come in various sizes and shapes for the same sized driver. Neither we nor anybody else will ever be able to produce all styles and shapes of engine parts. In some cases, a different engine number series will change the part used on the engine, so we have given the engine number for the part code.

INDEX

An alphabetical index would be rather lengthy since it is difficult to know which of several names should be used for many parts. For simplification and quick reference, we have used the visual index, both for finding the name of the part and the price. To find a part which interests you, simply look at the engine drawing on the back cover and check it's number in the catalog. You will notice that each type of part has only one basic whole number (as on the index picture). A different size or style of that part is followed by a decimal. Therefore, you will only have to remember one basic number per part instead of three or four. When the name of the part is known but it's appearance is not, check the catalog of prices under the appropriate section - Running Gear, Boiler and Boiler Parts, Boiler Front or Tender, as you will probably know what section the part is in.

ORDERING

Send check or money order in U. S. funds, with order, to S Scale Locomotive and Supply, 7120 Oreon Dr., St. Louis, Mo. 63121. Minimum order $1.00, all postpaid (no C.O.D. or credit). Because of much higher postage outside USA, add 10%. Prices are subject to change without notice, as casters, brass and machining costs increase with the economy and wage scale. Catalog prices are expected to be increased July 1, 1971, (unless done before this date) to give dealers a discount so that they may sell to you directly, and to cover probable national advertisement in the "S Gauge Herald", "Model Railroader" or "Railroad Model Craftsman". You are, in effect, buying at a discount.

You Are About to Enter a Whole Exciting "New World"

That Will Make You a "Master Modeler" in

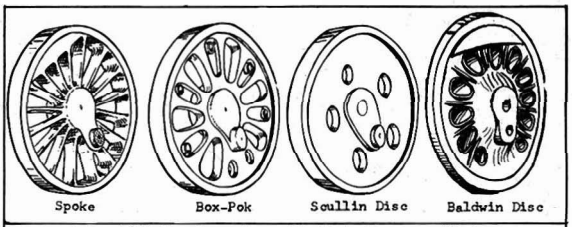
"True Scale"

Lost Wax Castings

(By engine kit "sections" and most "general" building order)

Basic Running Gear

Drivers



Quartered on .162" diameter axles with 22 tooth gear, #10.1a

Part Number Scale	Hi-rail	Diameter & Type	Quartered Flanged or Blind	Geared & Flanged	Engine Code	Unmachined Scale	Hi-rail
1.1		+51" Spoke			68*	.35	
1.2		56" Spoke			*		
1.3	1.3a	63" Spoke	$2.20	$2.90	MIKESk	.35	.35
1.4	1.4a	69" Spoke	$2.20	$2.90	bermo*	.35	.35
1.41		69" Box-Pok					
1.5	1.5a	72" Spoke	$2.50	$3.20	pc*	.45	.45
1.6		74" Spoke	$2.50	$3.20	*	.45	
1.61		74" Box-Pok	$2.50	$3.20	*	.45	
1.7	1.7a	79" Spoke	$2.50	$3.20	aHU*	.45	.45
1.71		79" Box-Pok					
1.72	1.72a	79" Scullin Disc 5 hole	$2.50	$3.20	U*	.45	.45
1.73	1.73a	Same 4 hole	$2.50	-----	U*	.45	.45

+__tooth gear (#) in 51" quartered sets. Same part numbers for quartered and unmachined centers.

As most of you know, in the past we have been using flat or 3° angle treads on much tighter curves than prototype, which does not operate properly on our tighter than protype curves.

Not only do most of our drivers, tires and wheels have the RP-25 contour,but experimentation shows our new 5-6° tread angles give the following advantages over 3° or flat treads.

1. Better differential action on curves, reducing drag by lessened skidding of one wheel and flange pressure on the rail. Reduced drag lessens chance of turn over on inside of curves and permits longer trains. Also less slipping of drivers from extra drag,with more even speed, as a result.
2. Cars center better on track,improving coupling operations.
3. Reduced tread contact for engines, surprisingly, gives better traction, an important quality.
4. Side to side rolling of treads on rail, in and out of curves, particularly, grinds off dirt and oxide much better than 3° treads, with less packing of dirt on treads. Thus keeping treads much cleaner-----less maintenance.

All our steel and brass wheels, and tires are pre-blackened for prototypical appearance, or a tooth if painting is desired. Steel wheels and tires have a special blackening which helps prevent rust by attracting micro quantities of oil from the journals, but not enough to pass to the rails.

The RP-25 fillet between tread and flange,besides reducing rail climbing, also reduces dirt build up, as this is the first place dirt starts to collect on wheels without fillets, then it spreads on out over the tread.

COUNTERBALANCES

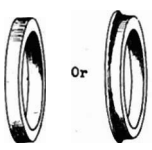
Style A

Style B.

Lost-wax cast for your convenience to use on our drivers,in 2 styles. (Only 2 shown of 6 or 8 in a set. Can be filed narrower from flat side.)

Part Number	Style	Driver Dia.	Demensions (Wide)	Code	Price
3.1	A	51"	6-1 , 2-1'2"	68	
3.3		56"			
3.5	A	63"	4-9", 2-11", 2-1'8"	MIKE	$1.45
3.6	B	63"	4-1', 2-1'6", 2-2'4"	S	
3.9	B	69"	4-10", 2-1'2", 2-2'7"	ber	$1.45
3.11	A	69"	4-1', 2-1'1', 2-1'5"	m	
3.12	A	69"	4-1', 2-1'6", 2-1'9"	oD	
3.16	A	72"	4-11", 2-1'4"	p	$1.45
3.17	A	72"	4-1'2", 2-1'7"	c	
3.21		74"			
3.23	A	79"	4-11", 2-1'4"	a	$1.45
3.24	A	79"	4- 9", 2-1'4"	HU	

TIRES



Blind Or Flanged

RP-25 contour, steel, 5-6 degree tread angle, and blackened. See discription under "Drivers."

Note: 51" tires could be used for 48"&53" Trailing Trucks, as only 1/4 of wheel shows below the Truck.

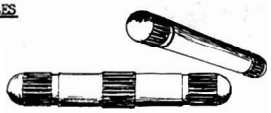
#5.1 Scale--51", 56", 63", 69", 72", 74", 79". ea. .35

#5.2 Hi-rail 63", 69", 72", 79". ea. .35

INSULATION For Tires. Hard, high temperature motor and transformer 'fish paper'. Best to machine Driver .017" smaller than I.D. of Tires for thumb pressure fit. Epoxy 'fish paper' in Tire, then epoxy Driver inside 'fish paper' Be sure Tire is flush to face of Driver.

#6.1 3-2"x4"x.007 thick .10

AXLES



.162" diameter, splined for Drivers, or splined for Driver and Gear, for use in our Frames. Grind ends of Axles flat.

#6.1 Plain or splined for Gear ea. .10

GEAR Brass

22 tooth Gear for use with #10.1b Worm,giving a 22:1 ratio. Useable on 56" and larger Drivers.

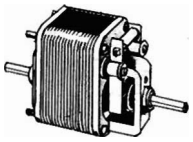
#10.1a .730" dia., .125 wide, .163" hole $1.00

WORM Steel, single thread

For use with #10.1a Gear. An ideal ratio to give prototypical speeds, using 7000 to 8000 rpm motors(Pittman DC-86). (Engines with small Drivers are generally proportionally slower than those with larger Drivers.)

#10.1b .375" dia., .500" long, .124 hole $1.00

MOTOR Pittman DC-86



#10.1 Gears and Worms designed for this Motor. Alnico VI,field, .012 hp. (¼th more power than old DC-91's .0093 hp.) at 7500 rpm at 12V.D.C. 1 29/32" long, 1 1/16" wide, 1 3/8" high. 1/8" shaft 1/2" long on each end.

#12.1 $2.25

#12.2 Same-Drilled and tapped, with #101.1b worm installed for our frames. $2.75

FLY-WHEEL Usually Brass

Particularly for DC-86's. Because of the small armature, a flywheel helps smoother starts, better feel to acceleration, deceleration and gliding stops rather than sudden stops. Demensions are approximate.

#13.1 1" dia., 1/2" total length, 1/8" hole, 2-56 set screw. ____

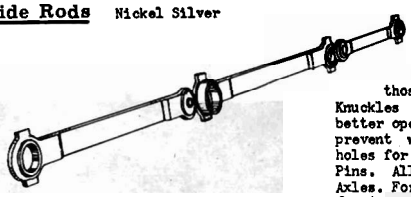
CRANK PINS

For better grip to driver, 2-56 thread .200" long. Filister heads for smaller prototypical diameter,except for Eccentric Crank,and Main Rod, which is flat head and long shoulder. They can be filed hex head and shallower,with slott sawed deeper. Shoulder is durable.105" diameter stainless steel sleeve. Sleeve can be removed to insert different 2-56 screw.

#14.1 .075" long shoulder pr. .30

#14.2 .250" long shoulder pr. .30

Side Rods Nickel Silver



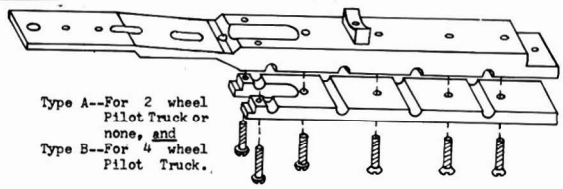
All rods universal right-left. All oilers on-----remove those not needed. Knuckles jointed for better operation, and to prevent warp. .105" holes for our #14 Crank Pins. All Rods for 4 Axles. For 3 axle, remove front section.

#16.1-	51" use, 5'6" betw. hole centers.					6*	____
#16.2	51" "	5'	"	"	"	8*	____
#16.4	56" "		"	"	"		
#16.6	63" "	5'8"	"	"	"	MIKESk*	$1.75
#16.							
#16.9	69" "	6'2"	"	"	"	Plain bermo	$1.75
#16.							

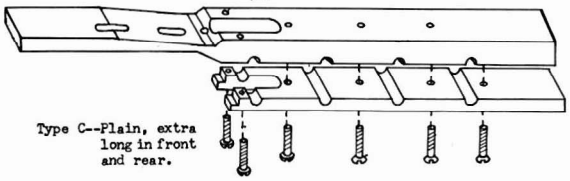
#16.							
#16.12	72"	"	6'5"	"	"	"	Fluted pc $1.75
#16.							
#16.16	74"	"		"	"	"	
#16.19	79"	"	7'3"	"	"	"	Fluted aHU $1.75

NOTE: For plain Side Rods. fill Flutes with Solder and laquer to preserve the color.

Frames With .162" diameter axle holes, spaced as above Side Rods.



Type A--For 2 wheel Pilot Truck or none, and
Type B--For 4 wheel Pilot Truck.



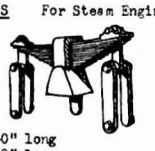
Type C--Plain, extra long in front and rear.

All Brass, so easy to change by sawing, filing or soldering to. Available notched for our Steam Chests, or plain and extra long in front and rear for your particular fitting. All Mounting for Pittman DC-86 motors and our Gears and Worms(#10.1a & #10.1b).

Since the experts do not agree as to whether a sprung or rigid Frame is best, we made ours rigid, with instructions so even a novice can spring them, to give you a choice,----and cheaper.

Part Number	Driver Size	Number of Axle Holes	Frame Type	Engine Code	Price
#18.1	51"	3	A	6	
#18.11	51"	4	A	8	
#18.12	51"	4	C		
#18.2	56"				
#18.21	56"				
#18.3	63"	3			
#18.32	63"	4	A	MIKESk	$7.00
#18.33	63"	4	B		
#18.34	63"	4	C		
#18.4	69"	3			
#18.42	69"	4	A	ber	$7.00
#18.43	69"	4	B	moD	
#18.44	69"				
#18.46	69"	4	C		$7.00
#18.48	69"	5	C		$7.00
#18.5	72"				
#18.51	72"	3	A		
#18.52	72"	3	B	pc	$7.00
#18.6	74"				
#18.61	74"				
#18.62	74"				
#18.8	79"	2			
#18.81	79"				
#18.82	79"	3	A		
#18.83	79"	3	B	aHU	$7.00
#18.84	79"	4	A		
#18.85	79"	4	B		
#18.86	79"	3	C		

LEAF SPRINGS For Steam Engines



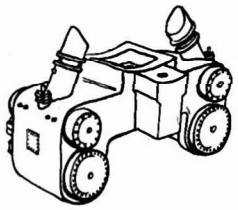
These have complete detail of spring leafs, hangers, etc. On all engines. Fine detail to fill in that blank look between Boiler and Frame.

#20.1	40" long	68pacMIKESberk*	pr.	.35
#20.2	48" long	moHUD*	pr.	

BRAKE SHOES

#23.1

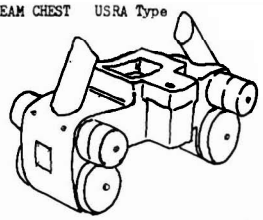
STEAM CHEST All interchangeable on all Frames, modern



Full prototypical detail of rivets, nuts etc. We cannot possibly produce all possible variations. These are on most modern engines, or small changes on others, such as filing off rivets or other details.

#25.1	Bolted front plates	Sber	$4.00
#25.2	Same, but 2 piece, with alignment pins.		3.45

STEAM CHEST USRA Type



Used on all USRA Mikes, Pacifics, Mountains and a great many other modern and semi-modern engines. Probably the most popular Steam Chest. As with above Steam Chest, changes can be made, such as filing front cover plates thinner, etc. (Cover Plates thicker for some engines, file thinner for USRA's.)

#25.5 Plain front plates 68pacMIKESmokHUD

Running Gear Details

VALVE GUIDES

Sits on rear of Steam Chest for Valve Rod and Combination Lever. On a great many before and after the USRA era. Sometimes mounted upside down.

#26.1 68pacMIKESmokHUD pr. .70

VALVE CROSSHEAD

Beautiful full detail. Sits on rear of Steam Chest to recieve Valve Rod from Valve Gear and Combination Lever. Lubricator sits on top. Kit of a pair of Valve Crossheads, fluted Combination Levers, forked Union Links and pins.

#28.1 ber pr. $1.60

LUBRICATOR, MECHINICAL (DETROIT B)

Sits on top of Valve Crosshead, or other locations. A jewel of detail. Kit of 2 Lubricators, 4 rods, and assembly pins.

#29.1 cberHUD pr. $1.10

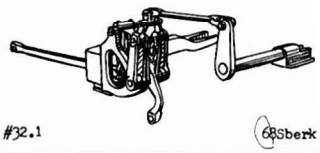
UNION(CROSSHEAD) LINKS & COMBINATION LEVER

For engines using Valve Crossheads, these are included with them. These are on all modern and semi-modern engines.

#30.1 68pacMIKESmok pr.

Valve Gears All interchangeable

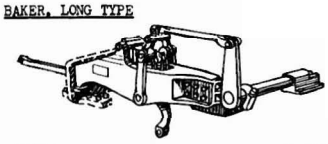
BAKER, TRIANGULAR TYPE



Very popular type. Includes Single Crosshead Guide Mount, #34.1, that can be ground off and other Mounts(Yokes) fitted. All rods and levers in 12 piece kit.

#32.1 68Sberk pr. $4.00

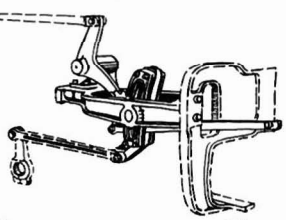
BAKER, LONG TYPE



One of the most popular types too. Has all rods, and alignment holes to recieve interchangeably #34.1, #34.2, & #34.3 Yokes, for easier installations.

#32.2 paKmoHUD pr. $4.00

WALCHERTS USRA TYPE



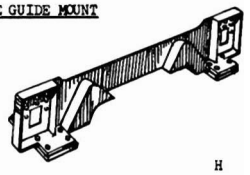
Also very popular type. Mountings made to be interchangeable with above Gears. (Broken line parts not part of kit.

#32.3 cMI pr.

Yokes (Mounting for Crosshead Guides)

All 3 of these Yokes show all nut and rivet details, and all have alignment pins to be interchangeable on the Long Baker Valve Gear.

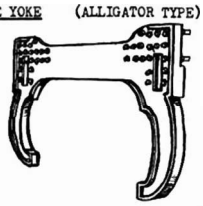
SINGLE GUIDE MOUNT



Generally used on more modern engines. (Made on Triangular Baker Valve Gear.)

#34.1 H $1.00

OUTSIDE YOKE (ALLIGATOR TYPE)

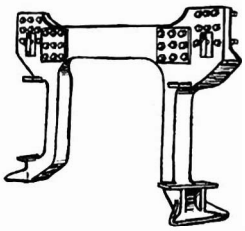


This Yoke gives a very good, dignified, appearance, protruding out from the engine and Crosshead Guides, showing all the nut detail.

(Alligator-Double)

#34.2 68MIKESk $1.35

INSIDE YOKE (ALLIGATOR TYPE)



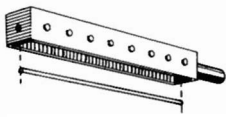
Probably the most popular Yoke type. Includes bottom step for NYC engines, or ground off for others.

#34.3 pacmoUD $1.35

Crosshead Guides

Nickel Silver

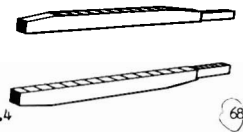
SINGLE TYPE



Front dowel fits into Steam Chest. Single Crosshead #37.1 slides inside.

#36.1 berH pr. .80

DOUBLE TYPE (ALLIGATOR)



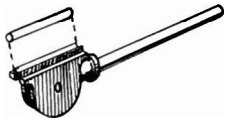
This is by far the most popular type, used with #37.8 Crosshead. Also soldered right into Steam Chest.

#36.4 68pacMIKESmokUD pr. —

Crossheads

Nickel Silver

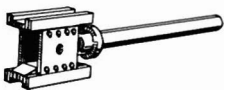
SINGLE TYPE



Drilled and tapped for 2-56 screws, with operating tube, with screws.

#37.1 berH pr. $1.00
#37.2 Same Less screws, and undrilled. pr. .90

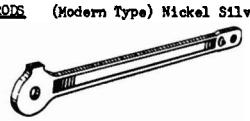
DOUBLE TYPE (ALLIGATOR)



All nut detail. Drilled and tapped for and with 2-56 screws. The most popular type.

#37.8 68pacMIKESmokUD pr. $1.20
#37.9 Same Less screws, and untapped. pr. $1.00

MAIN RODS (Modern Type) Nickel Silver Fluted



#40.2
#40.3 10' 11" between hole centers berkS* pr. $1.00
#40.4 9' 8" " HUD* pr. —
#40.5

MAIN RODS (USRA Type) Nickel Silver

Universal right & left. Cut off Oiler not needed. Fluted.

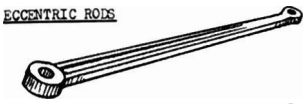
#40.7 10' 6" between hole centers 6MIKEac pr. $1.00
#40.8 9' 2" " " " 8 pr. $1.00
#40.9 8' 6" " " " 8mo pr. —

ECCENTRIC CRANKS

1' 6 1/2" between hole centers and counter sunk for main Crank Pin. Can be filed narrower for many engines.

#41.1 Countersunk 68pacMIKESmoberkHUD* pr. .50
#41.2 Same, but not countersunk pr. .40

ECCENTRIC RODS

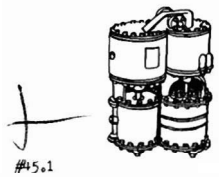


Fluted on more modern engines, plain on the older ones.
P&F= Plain one side and fluted other side for either use.

#42.1 Fluted. 7' 5" between hole centers. aSber* pr. .60
#42.2 P&F 6' 7" " " " " 68MIKEmokHUD* pr. —
#42.5 P&F 5' 6" " " " 8c pr. —

Air Pumps

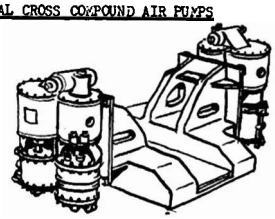
CROSS COMPOUND AIR PUMP (COMPRESSOR)



Has all nut and contour detail. On most all engines, modern or semi-modern. On Pilot Deck or left side of engine. We are told this one is the best in any gauge.

#45.1 68pacMIKESmo ea. .85

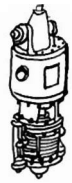
DUAL CROSS COMPOUND AIR PUMPS



Same as above, but two Pumps mounted on brackets, which are on dummy Frame Front, and it on a base that sits on Pilot Deck. All one piece, no soldering. Can be fitted to AF engines.

#45.2 berkHUD $2.65

9" SINGLE COMPRESSOR



Used on much older engines, before WWI.

#45.9 —

11" SINGLE COMPRESSOR

Used as above.

#45.11 —

COMPRESSOR FILTERS (N.Y. Air Brake)

Exact duplicate for that added, extra super detailing, with pipe to reach compressor. Probably used with all Cross Compound Air Pumps.

#47.1 68pacMIKESmoberkHUD ea. .15

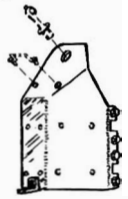
COMPRESSOR GOVERNOR (Westinghouse Type AD)

As with above, for that extra superdetailing that makes the difference. Exact duplicate. One per engine. Probably used with all Cross Compound Air Pumps.

#48.1 68pacMIKESmoberkHUD ea. .30

Compressor Shields

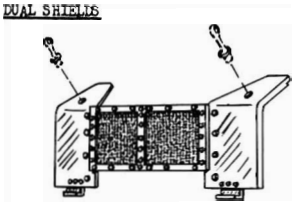
SINGLE SHIELDS



All rivets, angled mounting brackets on the bottom and angle iron reinforcement in back. This type on most engines. (for Posts & Irons, see #52.1.)

#50.1 beHUD pr. .80

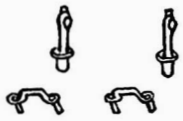
DUAL SHIELDS



Beautigul, with screen between shields, rivets, nuts and brackets. Gives massive appearance. Popular on modern C&O and their subsidiaries.

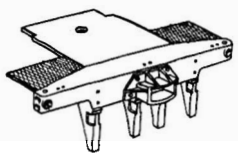
#50.4 r .85

GRAB IRONS & POSTS FOR SHIELDS



#52.1 berkH pr. .35

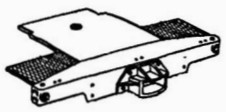
PILOT BEAM, DECK & COUPLER POCKETS



Treaded Deck, Coupler Pocket, drilled & tapped for coupler shank Starter holes for Flagstaffs, Uncoupler Brackets and Beam Steps. For modern engines. Knees, below Beam, to reinforce Pilot. Probably better for model use than those below.

#54.1 With Knees SberH* $1.75

SAME Semi-modern



Used on semi-modern engines, such as USRA's etc.

#54.2 Without Knees pacMIKEnok* $1.75

FLAGSTAFFS

With dummy groove for flag attachment. On practically all engine's Pilot Beam. Shorten Staffs from top for some engines.

#56.1 pacMIKESmoberkHUD pr. .20

UNCOUPLER BAR BRACKETS

For that fine, realistic detail on Pilot Beam and rear Tender Beam. Beautiful small super-detailing, with rivets even, and hole for piano wire Uncoupling Bar. On most all Engines and Tenders.

#57.1 pacMIKESmoberkHUD* .40

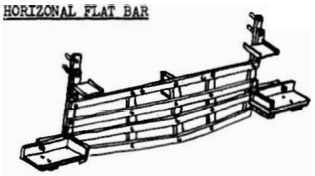
AIR HOSES

Single one used on Pilot Beam of Engines. Double one on Tenders and cars.

#58.1 All

Pilots All interchangeable with pins to fit holes in Pilot Beams.

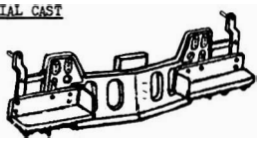
HORIZONAL FLAT BAR



Used on many engines, particularly NKP & NYC. If steps are ground off, would be very close to Penn.R.R. Pilots. (Could replace AF K-5 Pilot.)

#60.1 b* .85

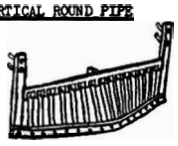
PARTIAL CAST



Gives a beautiful massive look to front of modern engines. Popular on C&O and Vgn engines.

#60.2 r $1.05

SHORT VERTICAL ROUND PIPE

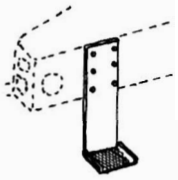


probably the most popular single type Pilot. On most USRA's a really sharp casting.

#60.3 pacMImoe .80

Steps These gives that real look. All treaded.

BEAM STEPS (USRA TYPE)



Wide treaded strap steps, placed at ends of Pilot Beam of most USRA's, as well as many others. Very popular.

#62.1 pacMImo pr. .35

CENTER BEAM STEPS

These mount under center section of the Beam, to stick out over the Pilot. Very popular.

#62.2 eD* pr .35

PILOT STEP, TRIANGULAR

More modern style, to mount on side vertical members of the Pilot.

#62.5 eH pr. .35

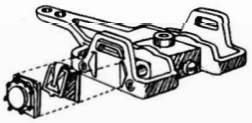
FRONT STEPS (LADDER)

Treaded Steps from Pilot Deck to Running Boards. On practically all Engines. Steps extra high, so part can be removed to fit any engine. Could be made into a step ladder.

#62.8 pacMIKESmoberkD* pr. $1.00

Pilot Trucks (LEAD or PONY TRUCKS)

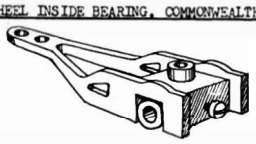
2 WHEEL OUTSIDE BEARING, COMMONWEALTH DELTA



Used on many modern Engines. Very well detailed Truck and Bearings.

#64.1	With Plain Journals e	$2.15
#64.2	With Roller Journals br	$2.15

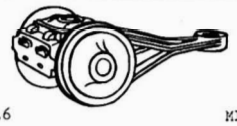
2 WHEEL INSIDE BEARING, COMMONWEALTH DELTA



Same Truck as above, furnished without Journals, so bearing housing can be cut off for modern prototypical inside Bearing Pilot Truck.

#64.3	Above Truck without Journals.	$1.75

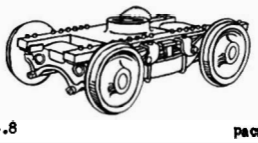
2 WHEEL INSIDE BEARING, COMMONWEALTH



Popular on engines of the USRA era.

#64.6	MIKESk	—

4 WHEEL INSIDE BEARING



Probably the most popular type of all Pilot Trucks.

#64.8	pacmoHUD*	—

NOTE: 33" wheels most common, and will be furnished unless 36" are requested. For hi-rail, prefix part number with 'a'

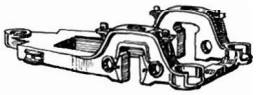
Trailing Trucks (Less Wheels, see choices, #241-#246)

4 WHEEL COMMONWEALTH DELTA (SPRUNG)

This is a very nice Truck, well detailed--- the most popular of many that looks practically like it. Use one side pick up wheels of usually 36" passenger and 45" spoke. Each of these diameters vary slightly from engine to engine. Top of Truck can be changed some.

#65.1	Plain Journals, opening lid and Springs beHU	$4.40
#65.2	Roller Journals and Springs r	4.40

2 WHEEL COMMONWEALTH DELTA

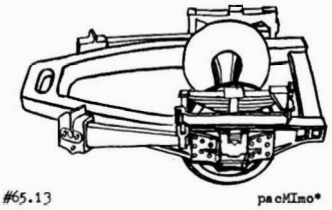


Very nice, but very difficult one piece casting. Usually used 43" or 45" spoke wheels (one side pick-up). These could be used on USRA's, as they later replaced the Hodges Truck.

#65.7	Plain Journals, opening lid and Springs HES*	$2.00
#65.8	Roller Journals, and Springs (seldom used) D*	2.00

NOTE: For Plain Journal Lids, there is a choice of Plain Lid, used on older USRA era engines, or modern pyramidal type, pictured in #67.2. State which preferred, or we will have to guess your needs.

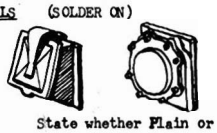
HODGES (USRA TYPE)



A super detailed truck. Used on most all USRA engines. 43" spoke Wheels included.

#65.13	pacMImo*	—

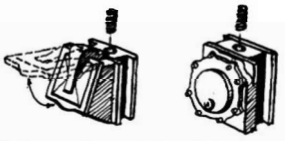
JOURNALS (SOLDER ON)



From Pilot Truck. Can file off other type journals on other Trucks and solder or epoxy these on. State Plain or Roller.

#67.1	State whether Plain or Roller	pr.	.40

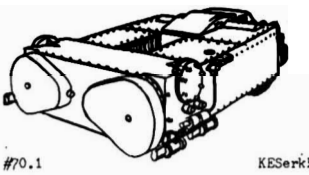
JOURNALS (For sprung use)



From #65.1 and #65.2 Trailing Trucks, for other uses. With Springs. (On Plain Journals state whether modern pyramidal (shown) or flatter, older type.

#67.2	State whether Plain or Roller	pr.	.70

BOOSTER ENGINE



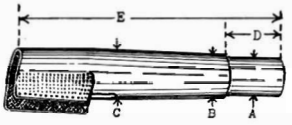
Used on Commonwealth Delta Trailing Trucks, and some others, (not Hodges). Full rivet detail. Type metal castings to give maximum weight to spring Trucks, and hold Trucks down.

#70.1	KESerkHUD		.45

Boiler & Boiler Parts

Boilers

All plain, very smooth sand castings (for lowest possible cost), with amply thick walls for necessary traction weight, rigidity, ease to work, change demensions, torch parts on etc., and can hardly be damaged. Easily cut shorter, filed to smaller diameter, or file Smoke Box rearward on the Boiler.



Since we could not stock all these Boilers, they have been grouped according to nearest comparitive size for least change by you. Instructions with each Boiler gives demensions for all engines it can be used for.

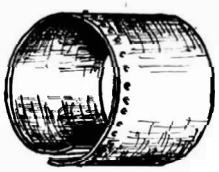
Demensions given here are before filing. At least one boiler under code will not need demensional changes. Others will need slight filing to smaller diameter some where. Smoke or fire box sawed shorter, smoke box filed rearward, or combination of these.

Part #	A	B	C	D	E	Code	Price a	Price b
72.2	5'4"	5'9"	5'9"	5'6"	26'	(6*)		
72.4	6'6"	7'	7'	6'3"	29'3"	8*		
72.6	5'10"	6'3"	7'2"	6'5"	37'3"	p*	$4.50	$7.00
72.8	6'9"	7'2"	8'2"	8'6"	42'	MIKEacmHU*	$4.50	$7.00
72.10	7'6"	7'9"	8'6"	9'6"	44'	Sberk*	$4.50	$7.00
72.12	7'1"	7'6"	8'3"	9'6"	44'6"	IoD*		

('A' demensions under wrapper)

"a" following part number for undrilled Boiler.
"b" following part number for Boiler drilled for general running board location, Frame holes, also tapped for Cab installation.

SMOKE BOX WRAPPER (DIE STAMPED)

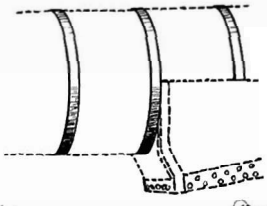


Even with a number of pictures it is difficult to tell whether an engine has single or double row of rivets (possibly not all in front row). In the codes we have used our best judgement of pictures and plans available. All plenty long and wide to solder around any size Smoke Box. All .012 thich.

#74.1	Single row of rivets b*		—
#74.2	Double row of rivets (6)8pacMIKESmokUD*		
#74.3	Plain, no rivets erH*		.35

Note: On some engines, part of the front row are to be filed off, usually from 'center line' of Smoke Box and over the top. Some engine's Smoke Box Wrappers do not have rivets. This Plain Wrapper could be used for other purposes

BOILER BANDS



These are a little difficult for some to install, but not too bad if instructions are followed. They do give an engine a more realistic appearance.

#76.1	(6)8pacMIKESmoberkHUD*	9 bands	.30

BOILER FRONTS

All for semi-modern to modern use. Full rivet, nut, straps and hinge detail, with rear flange for mounting.

#78.2	98"-94"	e	$1.70
#78.3	94"-92"	er*	1.55
#78.4	92"-89"	bS*	1.55
#78.5	89"-86"	IEokHUD*	—
#78.6	86"-83"		—
#78.7	83"-80"	8aMr*	—
#78.8	80"-78"	pm*	—
#78.9	78"-75"	c*	—

BELL IN RACK

Used on the very latest engines. Steam operated.

#80.1 br .40

BELL IN 45° Frame

A very beautiful, prototypical, two piece working Bell.

#80.2 pacMIKSmocH .60

BELL, BOILER MOUNTED

Two piece working Bell for installation on top of Boiler.

#80.5 EUD —

NUMBER BOARDS (MODERN, VEINED)

Real "eye catching", hollow Number Boards, that can be illuminated with our #620.1 bulbs, for more realistic appearance.

#82.1 Sber pr. $1.00

CLASSIFICATION LAMPS

Full minute detail. Like above Number Boards, hollow for illumination. (How about that?) And not oversized either.

#84.1 pacIKESmoberkH pr. .50

Headlights (All in two pieces for full detail and stands)

MARS LIGHT

These lights were used on the very latest engines, as warning lights, in addition to, and above regular Headlight. (Our coding may be incomplete, as their use was rather scattered thru various "engine series".)

#86.1 b .65

HEADLIGHT (PYLE NATIONAL)

Minutely detailed and hollow for illumination of Side Boards even. Also used on some modern Tenders. Visors easily soldered on.

#86.3 SberHUD .65

HEADLIGHT (SUNBEAM #4414 & 2618)

Hollow for illumination of Number Boards. On most USRA engines. Also used on some Tenders.

#86.7 68pacMIKEmok .65

(SUNBEAM #4414-b)

Hollow for illumination of Number Boards. Also sued on some Tenders.

#86.8 .65

WASHOUT PLUGS (CLOSED TYPE)

Used on more modern engines.

#92.1 oberH doz. .85

WASHOUT PLUGS (OPEN TYPE)

Older and most popular style that shows plug.

#92.2 68paMIKESmokUD doz. .85

(BOILER & BOILER FRONT)

Boiler

Boiler Front

Probably all engines have these. Two on each Boiler side, and one or two on Boiler Front.

#94.1 all set of 6 .40

Engine Plates (All Photoengraved)

LIMA (BUILDER'S PLATE)

Usually one on each side of the Boiler, for all Builder's Plates.

#96.1 8MKEberkD ea. —

(BUILDER'S PLATE)

Often more than one builder built the same model engine.

#96.2 68caMmoH ea. —

(BUILDER'S PLATE)

#96.3 68paIMESmoU ea. —

OWNER'S PLATE

On one side of the Boiler on some engines, on both sides of others.

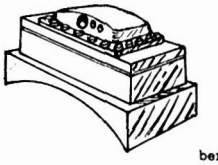
#96.4 all ea. —

SUPERHEATER PLATE

These are recognized, generally, by the bump on the middle of the plate. Generally located on the right side of the engine only.

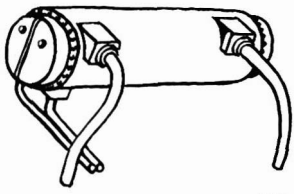
#96.5 KbkHD ea. —

FEEDWATER HEATER (WORTHINGTON TYPE S) See #140.1 for Pump.



#100.1 berHD .45

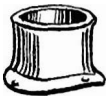
FEEDWATER HEATER (ELASCO)



See #144.2 for Pump. These Heaters will really dress up your engines, giving them that robust, powerful look.

#100.3 cKES —

SMOKE STACK (MODERN & SEMI-MODERN)



Used on some USRA's right on to modern engines.

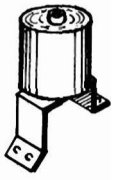
#102.1 2'2" dia. x 1'6" high 8acIESberH .45
#102.2 2' dia. x 1'1" high oUD —

SMOKE STACK (SEMI-MODERN)

USRA and older style tall Stack.

#102.3 2' dia. x 2'1½" high pMKm .45

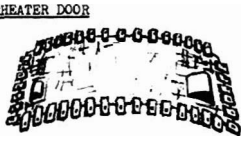
MILLER MUFFLER



Full detail and stand. Usually on right or left side of Smoke Stack, on Boiler. A modern touch.

#104.1 berH .40

SUPERHEATER DOOR

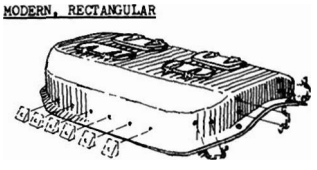


Full clamp and nut details. On many engines. (Some engines had a plain plate that could be made from scrap stock.)

#106.1 6' wide x 2' 10' long EbHUD .60

Sand Domes (All have nuts around the base, holes for Sanders or Sander Blocks, and starter holes for Grab Irons, #170.1)

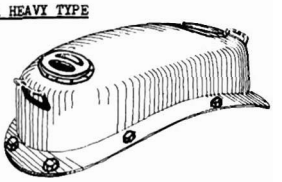
MODERN, RECTANGULAR



With Hatches and Hatch Handles. Slightly narrower at one end. The top corners can be filed more rounded for some engines.

#108.1 9' long x 7' avr. width x 9½" hi. berH $1.40

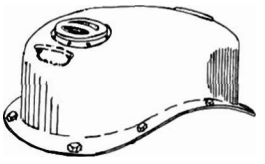
USRA HEAVY TYPE



With Hatches and their rivets and Hand Holds. For all USRA Heavy Pacifics, Mikes, Mountains, and some Northerns. Very popular with a great many others.

#108.5 4' long x 6'2" wide x 11" hi. cISo $1.05

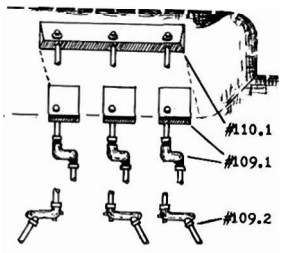
USRA LIGHT TYPE



All same as above, but for USRA Lights. Slightly different shape, more oval on top and taller.

#108.6 4' long x 4'10" wide x 1'6" hi. pMKm $1.05

SANDERS (N.Y. AIR BRAKE) & SINGLE SQUARE SANDER BLOCKS



With mounting pins on the back. On more modern engines. Often #109.2 Sanders used in these Sander Blocks. On modern engines.

#109.1 br doz. $1.30

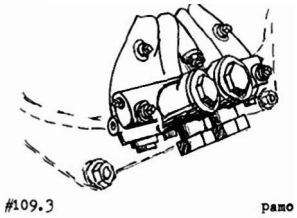
SANDERS (BREWSTER TYPE A or GRAM WHITE TYPE C)

Pictured above

Quite popular on modern engines, and some older ones, such as latter Heavy Mikes. Used on Sander Blocks, such as #109.1 or #110.2.

#109.2 cSerk doz. $1.00

SANDERS



Quite popular in the USRA era.

#109.3 pamo pr. —

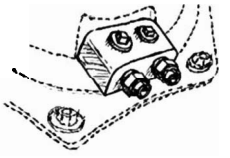
SANDER BLOCKS (3 IN ONE)

Pictured above

as with others, pins on the back for mounting on Sand Dome. Starter holes for Sanders, such as #109.2 or #109.1 Sanders.

#110.1 2'8" long Sek pr. .30

(2 IN ONE)

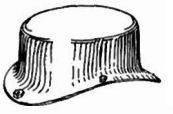


Same as above. Used on some Mikes, and many others. Sometimes Sanders not used with these.

#110.2 8½" long cMIS pr. —

Steam Domes

MODERN & SEMI-MODERN (LIGHT USRA'S)



Probably the most popular size. 3'3" dia. x 1'2" high, above Boiler.

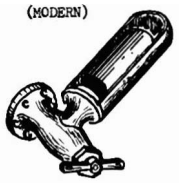
#112.1 8pcMKESmberkH .45

SEMI-MODERN (HEAVY USRA's)

3'4" dia. x 10" above Boiler.

#112.2 aIo .45

WHISTLE (MODERN)



Fully detailed two piece Whistle, so it can be mounted in any manner.

#114.1 SberkDH .35

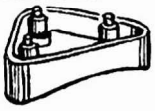
WHISTLE (OLDER STYLE)

Its use was probably discontinued about the end of the USRA era.

#114.2 pacMIKEmo —

POP VALVES

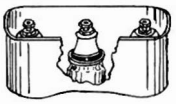
TRIANGULAR, 3 UNIT TYPE



Used on more modern engines.

#116.1 ber .40

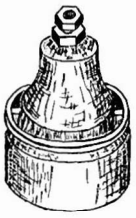
RECTANGULAR, 3 UNIT TYPE



Used on both modern and semi-modern engines.

#116.2 KEk —

UNITS ONLY



It appears single units were used, without housing, up to just after the USRA era. Usually 2 or 3 units.

#116.6 8pacMISmoH ea. —

LOWER WATER ALARM CASING (NATHAN)

Used on latter model engines.

#118.1 cSber .35

BLOW OFF MUFFLER (OKADEE)

Also used on more modern engines.

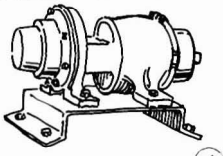
#120.1 berH .20

TURBOGENERATOR (PYLE NATIONAL)

This is the item that furnishes electricity for Headlights etc. Some few engines had two of them. This style used on more modern engines. You will hardly believe the tiny detailing.

#122.2 8MESmberHUD .45

Turbogenerator (SUNBEAM)

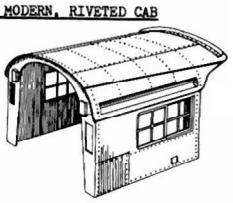


This or above on practically all engines. This one generally on the older ones.

#122.2 6pacIKok —

Cabs

LARGE, MODERN, RIVETED CAB



This is a very popular Cab. All lost-wax cast, including roof, window beading, rivets, slotted flat head screws, and Grab Iron well above the cast windows. Has corner assembly lugs with holes to solder wire pins or tap for 00-90 screws. Rivets can be filed off for many welded Cabs.

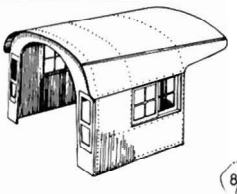
#124.1 7'4" long x 10'8" wide x 8' hi. berD $4.60

LARGE, MODERN, WELDED, SLOPE FRONT CAB

For very modern engines.

#124.2 7'6" long x 10'10" wide x 8'5" hi. H —

MEDIUM SIZE USRA TYPE CAB

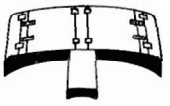


Used on all USRA engines. This and #124.1 seem to be the most popular Cabs.

8pacMIKESmokUD

#124.5 6'6" long x 10' wide x 7'8" high —

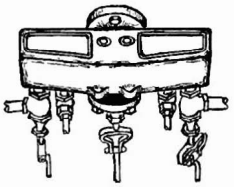
TURRET (COVERED TYPE)



This is actually the Turret cover, used right after USRA era. Used on a great many engines. Front projection can be removed for many engines.

#126.1 berH .60

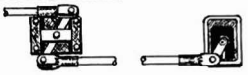
TURRET (OPEN TYPE)



On semi-modern engines (USRA era). A great deal of eye catching detail

#126.4 8paMIKSmok —

THROTTLE ROD LEVERS



On practically all engines after USRA era. Gives nice detailing, just add .020 piano wire between them, in cast holes.

#128.1 berHUD .45

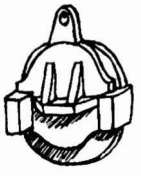
NOTE: Some parts are noted for use after the USRA era engines. Unless you are modeling this era, some parts can be put on USRA engines, as most were updated and in many cases were completely modernized.

CHECK VALVES (Nathan)

Words fail to describe its full fine detail. A real eye catcher on each side of the Boiler, with its piping.

#130.1 8pacMIESmoberkHUD pr.

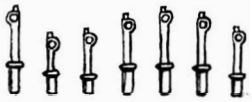
INSPECTION DOORS, SMOKE BOX



On semi-modern engines. Gives that added look of realism. on each side of the Boiler.

#132.1 8pacMIKEmok pr. —

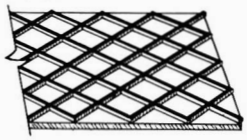
HANDRAIL POSTS



Cast in true shape. Plenty strong when Handrails are soldered in. Prototypically all posts are not the same length because of Boiler contour.

#134.1 2-5½", 6-8½", 8-10½" 8acMIKSmoberkHU* 16 .65

RUNNING BOARDS (SUNKEN DIAMOND) All photoengraved

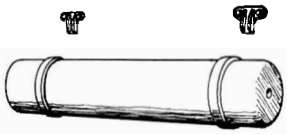


All engines need two tapered (along Boiler), and one strait (along Smoke Box). Scraps can be used as treads on ladders, steps, and tread areas on Tender Beams etc.

#136.1 Tapered, 128' long, 15" wide all* ea. .20
#136.2 Straight, " " " " all* ea.

Reservoir Tanks (With bands, Studs and holes for Piping)

ROUND ON ONE END, CRIMPED ON OTHER END



For all Tanks, usually there are 2 long tanks and 1 short,--or 2 long per engine.

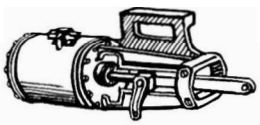
#138.3 18½" dia., 72" long b* ea. .45
#138.4 18½" dia., 108" long b* ea. .45

CRIMPED ON BOTH ENDS —

These and above Tanks can also be used for Diesels and other uses.

#138.6 18½" dia., 72" long MIKSe* ea. .45
#138.7 18½" dia., 92" long k* ea. .45
#138.8 18½" dia., 108" long e* ea. .45
#138.9 18½" dia., 114" long D* ea. —
#138.11 18½" dia., 120" long EU* ea. —
#138.14 18½" dia., 160" long k* ea. —
#138.19 20½" dia., 66" long mo* ea. —
#138.21 20½" dia., 84" long moH* ea. —
#138.23 20½" dia., 100" long 8pac* ea. —

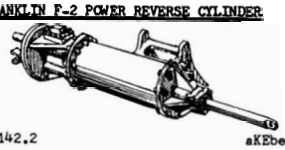
ALCO H POWER REVERSE CYLINDER



Almost indistinguishable from the G type. Unbelieveably super detailed. Very popular.

#142.1 68pacMSmor .75

FRANKLIN F-2 POWER REVERSE CYLINDER



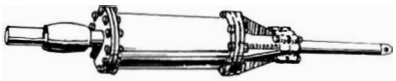
This and Alco H are the most popular. Unbelievable detail. Some USRA's of a series used this and above.

#142.2 aKEberkHD .75

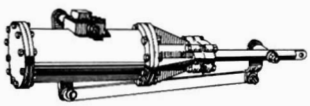
The following can be made by altering Franklin F-2. Note rear section is removed, the square block there removed and soldered on top of other type Reverse Cylinders. Levers made and fitted according to pictures.

FRANKLIN F-3 "PRECISION"

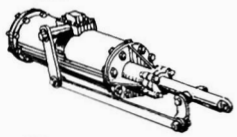
Ip



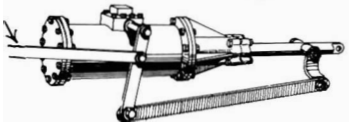
ALCO K



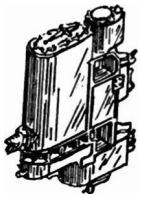
ALCO L



BALDWIN T



BL PUMP (WORTHINGTON)



Combination hot and Cold Water Pump with heater. This large pump is a real eye catcher hanging on left side of the engine.

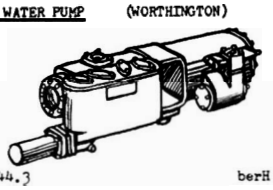
#144.1 .75

WATER PUMP (ELESCO)

Goes with Elesco Feed Water Heater, #100.3, and sits on left side. Both these give an engine that prototype look.

#144.2 cSk —

HOT WATER PUMP (WORTHINGTON)

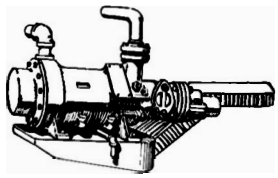


Used with Worthington type S or SA Feedwater Heaters. On many modern engines. Very highly detailed.

#144.3 berH .75

CROSS COMPOUND AIR PUMPS (See #45's)

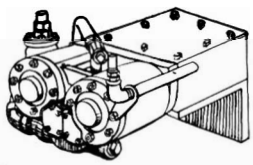
COLD WATER PUMP (CENTRIFIGUL PUMP)



This is one you will have to see to believe, with every nut, rivet, fittings and intricate contour. For modeling, sit on front of Trailing Truck frame, left side. Can be epoxied to AF Trucks. With Piping back along side of Trailing Truck, it's a real beauty.

#144.6 With mounting base berHUD .75

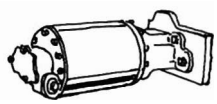
STOKER ENGINE (DOUBLE TYPE)



Sits under left side of cab to drive coal from Tender to the engine. On many engines.

#148.1 cbeU .75

STOKER ENGINE (SINGLE TYPE)



Used on USRA era engines,and shortly after.

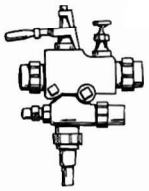
#148.2 paMIKESmok —

BOOSTER ENGINE PIPES

Beautiful detail that will really make an engine stand out. On all engines with Booster Engine in Trailing Truck.

#152.1 KEerkHUD pr. $1.05

INJECTOR (LIFTING TYPE)



Used on engines before WW-I. One or two to an engine, either in Cab or on Boiler in front of Cab.

#154.1 8 .40

INJECTOR (NON-LIFTING TYPE)

Used on semi-modern and modern engines, below cab, right side. Super detailed fittings and contours you will have to see.

#154.2 68MIKESmoberkHD .60

OVERFLOW FUNNEL

That added detail on the right side, behind rear driver. Can be used on Non-Lifting Injectors too.

#156.1 berH ea. .25

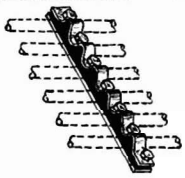
Small Hardware

Add these as desired for "Super Detailing"

PIPING Piping and Cooling Coils gives realism to your engines

#160.1 1", 2" or 3" Piping in 2' coils of spring brass. ea. .05
#160.2 5" or 6" " " " " " soft " ea. .10

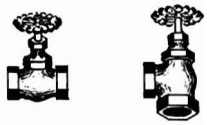
COOLING COIL PIPE CLAMPS (Or cut up for single Pipe Clamps)



Used on a great many engines for either Cooling (Condenser) Coils, or hold other parallel pipes. Each piece has 4-1" and 2-3" holes. Can be cut to single Pipe Clamps to fasten Piping to Boiler and other parts.

#162.1 68pacMIKESmork* ea. .30

1" & 2" ANGLE & GLOBE VALVES



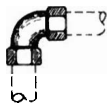
Used on all engines. Very finely detailed in exact duplication. With starter holes for piping. The best and cheapin any gauge. All gauges can use these.

#164.1 Cluster of 2 Globe & 1 Angle per size. All* 6- .60

3" GLOBE VALVES Even more detail than above. Besides engine, can be used on water pipes to Tender.

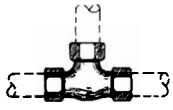
#164.2 All* ea. .25

PIPE ELBOWS



#165.1 All* —

PIPE T's



#167.1 All* —

PIPE JOINTS

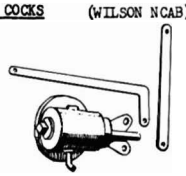
#169.1 All* —

GRAB IRONS

Castings (with rivets on either side) for that "real" look on Sand Domes, Boilers etc. Pins on back to solder in holes. Small but sturdy.

#175.1 All* 3- .20

BLOW OFF COCKS (WILSON NCAB)



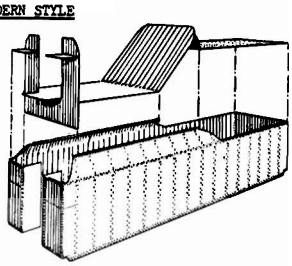
That small super detailing that stands out and makes the difference on an otherwise bare Fire Box. One to four on each side. Mounting pin on the back. Extra handle included for varying installations.

#178.4 berUD ea.

Tender Parts

Tender Wrappers

MODERN STYLE



Beautiful die stamped one piece, pre-bent shell. Rivets of actual size. Includes Coal Chute, false bottom and die stamped riveted Deck. This and USRA Tender probably the most popular two. With the below details you will have the best looking Tender going.

#200.1 40'4" long, 10'8" wide SberH* $4.25

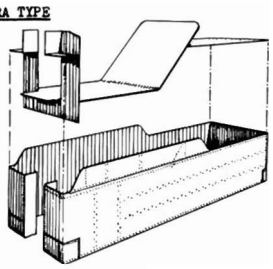
SAME But seconds. Some do not have bottom row of rivets (as on some Tenders) or other repairable flaw, such as small dent or small area of shallow rivets that can be punched back.

#200.2 $2.75

Same AS #200.1 But 4 sides cut in 2 pieces, so they can be cut down for shorter Tenders, or spliced together for larger Tenders. (Perfect stampings.)

#200.3 $2.00

USRA TYPE



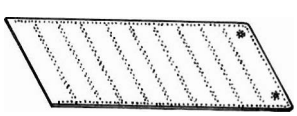
Used on most USRA engines. Die stamped prototype size rivets. Four sides pre-bent in one piece. Includes Coal Chute, false bottom, and die stamped riveted Deck. As with #200.1, when below details are added, you will have a fully detailed prototype in miniature. This is one of the most popular Tenders.

#200.5 29'6" long, 10'1" wide paMIKEmok* —

SAME #200.6 But seconds. Same as #200.2 for description and uses. —

SAME AS #200.7 #200.5 But 4 sides cut in 2 pieces for other Tender uses —

TENDER DECK (TOP)



From #200.1 and #200.5 Tenders, for other uses. Plenty long. Used on Tenders back before the USRA's. Can be fitted over existing Tender Decks, and trimmed narrower. (If a very long one wanted for extremely long Tenders, request it).

#209.1 All* .80

Tender Frames

FOR #200.1 WRAPPERS, MODERN

Good sand castings for rigidity, needed weight for electrical pick-up, and made of brass for easy working. Prototypical underframe contour, coupler and Draw Bar Pockets, drilled, tapped and milled to take wrapper prototypically.

#211.1 10'8" wide, 42'8' long over Sills. SberH $4.20

SAME #211.2 But not drilled or milled. $2.85

USRA TYPE FOR #200.5 WRAPPER

#211.4 paMIKEmok —

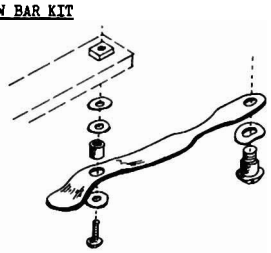
SAME #211.5 But undrilled or machined —

BOLSTER SCREWS For Tender Trucks

Shouldered for metal Tender Frames. 2-56 screw with shoulder .105 diameter and .075" long. (Do not use for Crank Pins.)

#212.1 pr. .30

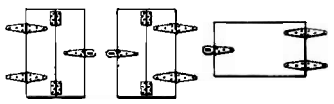
DRAW BAR KIT



For wireless Tender (unless Tender light is used).

#214.1 .40

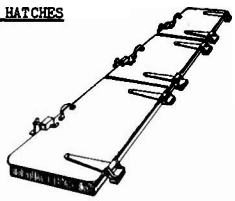
BUNKER DOORS



Usually 2 on front, one in rear. Includes Hinge detail. (Front Doors, 1'5" wide x 2'4" high. Rear Door, 2'4" wide x 1'3" high).

#216.1 SberH 3 .75

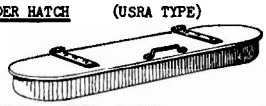
TENDER HATCHES



Three used lengthwise, in center of modern Tenders. Contains hinges, rivets, latch and starter holes for #175.1 Grab Irons.

#217.1 Each 4' x 1'8" square SberH 3 .70

TENDER HATCH (USRA TYPE)



On all USRA's. Rounded corners and starter holes for #175.1 Grab Irons.

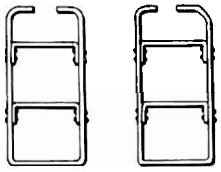
#217.2 6'6" x 1'11" paMIKEmokUD ea. —

REAR LIGHT (RECESSED TYPE)

Recessed into back of Tender. Hollow for Grain of Wheat Bulb. (Regular Headlights used on many Tenders).

#220.1 SberHUD .35

TENDER STEPS (STRAP METAL TYPE)



Full detail of bent strap metal and rivets, as shown. On practically all Tenders at rear, and many in front too. For shorter Steps, cut off top portion. Top shape can be changed by rebending. These are quite strong when prototypical brace from bottom of step to Tender bottom is installed (about 3/64" wide strap).

#222.1 1'1" wide, 2'3" high 8pacMIKESmoberkHUD pr. .50

TENDER STEPS (USRA CAST TYPE)

On front of many Tenders and all USRA's, with #222.1 at rear.

#222.2 68pacMIKEmokUD pr. —

Ladders Full details of rivets and rungs thru side of Ladder

LONG, SINGLE TOP RAIL

Used on larger, newer Tenders. (Could be altered as a regular rung ladder, or a couple soldered together as an extension ladder, for better maintenance of your homes, industry or railroad buildings. 6'8" between bottom rivet and top of Tender.

#224.2 SberH .60

MEDIUM, SINGLE TOP RAIL

Picture as above

On most USRA's and small Tenders. 5'3" between bottom rivet and top of Tender.

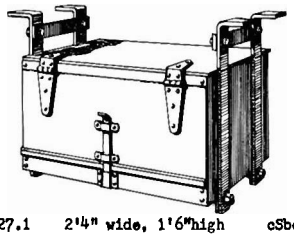
#224.3 68pacMIKEmokUD —

BUNKER "RUNG" LADDER

Full detail as shown.

#225.1 2'4" high, 1'4" wide All .35

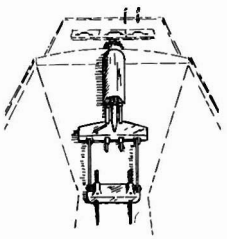
TOOL CHEST



You will be surprised to see all the strap metal securing, rivets, hinges and latch detail.

#227.1 2'4" wide, 1'6"high cSberH .45

COAL PUSHER

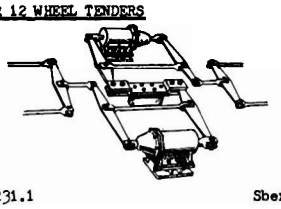


Used on older Tenders, and certain railroads.

#229.1 68p —

Brake Systems

FOR 12 WHEEL TENDERS



For those wanting the ultimate in detail. Two Cylinders, 10 Rods, and hanger.

#231.1 SberHUD 13 pcs. $2.95

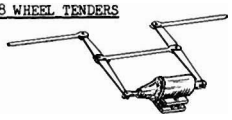
Note

Parts Installation Booklet

Individual instructions will no longer be sent for any parts, Trucks, Boilers, Valve Gears etc. included(except future new parts). This booklet will save you money in a short time, as cost is borne mostly by this catalog (not added to parts cost), save us tremendous instruction looking time, and your instructions are all together by part numbers, not a hundred loose ones, or extra cost of packaging each part with instructions, and that printing cost. So for the first part ordered this booklet "IS A MUST". This booklet would be particularly useful for the novice to read and determine if he could build an engine. Do not allow the length of the booklet to confuse your ability tho.

#260.1 .25

FOR 8 WHEEL TENDERS

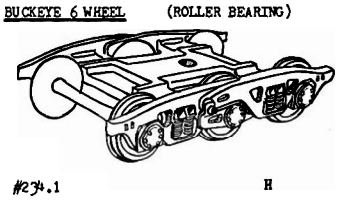


For USRA's and a great many others. Also on older 12 wheel Tenders.

#231.2 68pacMIKEmok 5 pcs. $1.35

Tender Trucks (Less Wheels)

BUCKEYE 6 WHEEL (ROLLER BEARING)

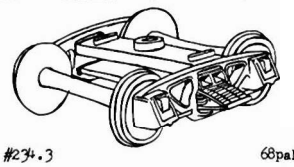


Well detailed, sprung and equalized. Uses 33" or 36" wheels, one side pick-up. (Less wheels, see #240 and #242.)This is a very smooth operating Truck.

#234.1 H $___

SAME, BUT PLAIN BEARING
#234.2 ber $___

4 WHEEL ANDREWS (LEAF SPRING)



Sprung and equalized. Used on many USRA's as well as a great many others. Very popular. One side pick-up wheels, of usually 33". See #240 and #241. (Less wheels.)

#234.3 68paMIK $___

4 WHEEL COMMONWEALTH DROP-EQUALIZER TYPE

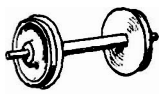
#234.4 Ek $___

6 WHEEL COMMONWEALTH CAST STEEL (ROLLER BEARINGS)

#234.5 UD $___

SAME, BUT Plain BEARINGS
#234.6 cS $___

Wheel Sets



All RP-25 contour, and blackened (except aluminum). See other design features under "Drivers", and artical on wheels. Some fellows like the dull clicking of steel wheels thru switches and over rail joints rather than high pitch alum. wheels.

33" For freight cars, generally Tenders, and some Pilot Trucks

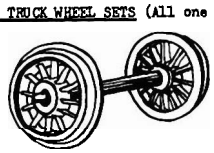
#240.1	Steel, one side pick-up		ea.	.35
#240.3	Brass, " " "		ea.	.35
#240.5	NS " " "		ea.	.35

36" For passenger cars, Pilot Trucks, 4 wheel Trailing Trucks, and some Tenders.

#241.1	Alum., one side pick-up(Miller's-3° treads)		ea.	.25
#241.2				
#241.3	Steel one side pick-up		ea.	.35
#241.4	" both " "		ea.	.35
#241.6	Brass one " "		ea.	.35
#241.7	" both " "		ea.	.35
#241.11	NS one " "		ea.	.45

NOTE: It is expected that we cannot get any more NS, so give an alternate on orders of NS wheel sets.

TRAILING TRUCK WHEEL SETS (All one side pick-up, brass or NS)



Some of these and all above wheel sets(except NS) are available without axle stiffener between wheels, on request. For special purposes, such as thru Booster Engines, Pilot Truck bearings, etc.

#243.3	43" Spoke	pacMIKESmo	ea.	$1.25
#243.4	44-45" Spoke	ESberkHD	ea.	1.75
#243.5				
#243.6	51" Disc	U	ea.	.60
#243.7				

HI-RAIL NOTE: Only #240.3, 241.6, 243.3 and 243.4 available. Suffix part number with 'a', or scale flanges will be sent.

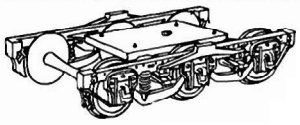
NOTE: Some wheel sets are expected not to be popular. If so, they will be discontinued when present stocks are gone.

PHOTOGRAPHS OF OUR KIT ENGINES (3½"x4" Prototype Photos)

#275.1	NKP #770-779	right, left, front, Tender	ea.	.15
#257.2	C&O #2750-2759	" " " "	ea.	.15
#257.3	PM #2135-2139	" " " "	ea.	.15

Passenger Car Equipment

COMMONWEALTH (PULLMAN STANDARD) 6 WHEEL TRUCKS



Very good sprung and equalized Trucks, with rigid insulated fibre Bolster to prevent skew and use all wheel pick-up to prevent light flicker. These Trucks were chosen for use on last of light cars, or file off side frame rivets and remove end braces at the Brake Shoes for use as cast steel Trucks, as used on heavy cars,---right on up to modern cars. So it is an extremely versatile Truck, with every nut and rivet detail. (Let us know if rivets are to be filed off for heavy use. We may have a few with short rivets, and save some filing.) You will have to see this Truck in operation to appreciate its beauty and extremely smooth operation, gliding over the rails. (Less Wheels, one or both side pick-up. See #241's for choice.)

#400.1 pr. $3.80

Miscellaneous Equipment

Springs

Sprung Trucks are no better than rigid ones if the spring tension is not matched to the vehicle's weight. Usually they are too stiff. Now various springs are available to match up the weight of your car, Engine or Tender, (or other uses). Just divide the weight of the vehicle by the number of its springs to find the ounces per spring. Use next lighter spring from tables below, to provide normal compression. The choice is not critical but if in doubt use a lighter spring, as the spring can be stretched, and it takes proportionally more weight to compress past the normal compression.

Check your rolling stock by lifting one end off the rail, then set slowly back on the rail. The springs should barely but noticebly compress. If they do not compress, they are too stiff, so you do not have a sprung Truck, but have a rigid frame Truck, unless equalized by looseness of Truck parts, which is not as efficient or look as well going thru switches and over uneven rail.

These springs were designed for those who insist on more prototypical appearance, by using larger wire size and closer coils than heretofore available. Try them out, and keep some on hand.

FREIGHT, TENDER & ENGINE TRUCKS (5" diameter, 10" high)
(Interchangeable with Kinsman springs)

#600.3	.5 oz.,	#600.4	.8 oz.,	#600.5	1.5 oz.,		
#600.6		#600.7				doz.	.25

PASSENGER CARS, TENDERS & ENGINE FRAMES (8" diameter, 12" high)

#600.14	2 oz.,	#600.15	2.7 oz.,	#600.16	4.4	oz.,	
#600.17		#600.18		#600.19			
#600.21		#600.22				doz.	.25

MICRO-MINATURE BULBS (6 volt)

The smallest bulb you have ever seen, one fourth the size of Grain of Wheat. Now you can illuminate the smallest parts, even our scale size Marker Lamps, Caboose Lights, Number Boards, Switch and Signal Lamps.(How about that?) Put various bulbs in series or parallel (these or with others) to equal your operating voltage (± 1 volt). see instructions for more detail.

#605.1 .052" dia., .150" long doz. $6.00 ea.

FLEXIBLE WIRE

Small, light weight double conductor, twisted, insulated wire, as used on our passenger Trucks. Single strand good for lighting. Truck wiring etc. Double strands between Engines and Tenders.

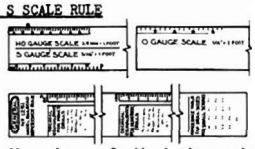
#609.1 per. ft. .05

SOLDERING PAINT (From Kemtron)

Solder and flux together in a thick liquid, that indicates when solder has melted by turning black, the black washes away with water. This and propane torch a must for Engine building. No big blobs of solder to file away as with soldering iron. We have used one bottle for 5 years of many patterns and about 4 Engines. So is very cheap to use.

#612.1 .75

63' S SCALE RULE



Professional stainless steel "General Hardware" S,HO,O, inches, cm, mm and 64th scales, so you can take demensions accurately from any magazine drawing and lay out S scale parts or drawings. Stop guessing at dimensions. On the back are decimal equivilents for number and fraction drills. Also tap drills and clearance drills.

#616.1 $1.25

AGING DRY COLORS

Easy aging of Engines, cars or structures in minutes, the natural true to life way, and **without harsh streaked, painted look. If you do not like the application, wipe it off and start over. While it is** a powder, it does hold up quite well, particularly on cars and structures. It is easy and quick to touch up color, or add more later as your taste changes, with a couple of strokes with a dry brush. No mess to clean up or ruin a paint job or decals. It is good to practise with before aging with paint. White--Water sediment around Pumps and Valves, cement, flour, aging black, etc. Burnt Sienna---Rust on Trucks, dust (mixed with black) etc. Black--Dust on Engines to remove shiny new look, or for adding age to all equipment. With white for for dust, oil grease or stain. See instructions. One of each color will probably age all your Engines and structures or all cars. possibly all.

#620.1 White, Burnt Sienna, or Black ea. .15

FIGURES WITH A "PERSONALITY"

3 Workmen

Engineer Fireman

5 Pedestrians

Not straight stiff figures, but in various natural stances, standing, walking, and sitting. In exact S scale. Full clothing detail in unpainted type metal, with small, less obvious bases than most other figures. Not difficult to paint. A lick and a promise is good enough, as they are viewed from too far to see intricate painting. So any novice can paint these, with clothing outlines cast on. With this varity of stances, you can fit them to any need.

#700.1 11 (1 ea.) $1.25 or 2- .25

CONVERTING TO SCALE OF A.F. ENGINES

1. **Send your Frame only, all Drivers removed.**
2. **Leave on rear Axle and Gear.**
3. **Completely describe Drivers you want, scale, hi-rail,center Drivers blind or flanged.**
4. Order quartered Drivers wanted(#1's).
5. Add 65¢ for return postage and extra handling.
6. If desired, order #14 Crank Pins, and #3 Counterbalances.
7. Allow 1-1½ months for delivery---so order ahead of time.

This is the challenge you have wanted, to have better scale flanges and treads, of one side pick-up of steel, for better operation. (Hudsons, P.R.R. K-5's, Pacifics and Northerns should have 79" Drivers, or Northerns could take our 74"(75")). Our Drivers have 2-56 threaded Crank Pin holes.

#800.1 Price depends on order.

Still More From Other

S Suppliers

The following listings are especially interested in helping and assisting you in your modelling. When writing or ordering from them, be sure to mention their listings here so they will know it is appreciated and worthwhile. As a matter of fact, we would also be interested in knowing, when writing or ordering from us, of your purchases herein, for the same reason.

STEAM ENGINES, LOST-WAX CAST, AND THEIR PARTS

Complete line of engine lost-wax castings, fittings, including brass, nickel silver and steel wheel sets, drivers, boilers, frames, trucks and engine kits, throughout this catalog. We have just started giving you engine parts and engines. Many more are yet to come. **This catalog $1.00, including future suppliments and parts installation at a token cost.**

S Scale Locomotive & Supply

Sn3 AND S LOST-WAX CASTINGS

Super-detailed brass castings for Sn3 freight and passenger cars. Also a few S standard gauge locomotive fittings. Complete kits for D&RGW narrow gauge boxcar, idler flat car, work gondola and caboose. Sn3 D&RGW 2-8-0 locomotive will be available also. Entire line of Kemtron S scale parts stocked. Address TOMALCO, P.O. Box 158, McCracken, Kansas 67556. List for SAE.

STEAM ENGINES

One of S gauge's oldest suppliers, retail as well as wholesale. Four locomotives (Rex designed) available: Dockside (0-4-0T), Suburban (2-4-4T), Mogul (2-6-0), and 0-6-0 switcher soon to be released. All high-grade Zamac, beautifully cast and detailed, Pittman powered. Valve gear kits for above; also tender for Mogul, and soon, sloped deck tender for the 0-6-0 switcher. Metal flat and gondola car kits. Rex trucks with scale or hi-rail wheels. **Pick-up wheel sets for tenders in stock (brass). Try our hi-rail wheel sets in your American Flyer conversions. Let us know what you need in the way of American Flyer equipment.** Machine shop service available. All locomotive parts available for scratch building. Some lost-wax items for locomotive (Rex) conversions to be announced. All Kemtron S gauge items in stock. 10¢ for pamphlet. S&P Distributors, 90 Lucy Lane, Northfield, Ohio 44067.

DIESELS

Beautifully detailed General Motors F-9 A and B diesel units, with sprung and equalized trucks. One motor per truck powers all wheels. Scale or hi-rail (tinplate) flanges. Minimum radius, 18". Paint jobs for the major roads listed are of the **highest quality. Special road names and paint jobs at extra cost. Set of A powered and B** dummy, $33.00; A powered, $26.00; B powered, $24.00; A dummy, $13.50; and B dummy, $11.50.

They also have 4-wheel Commonwealth Streamlined Passenger Trucks at $1.95 per pair. For address, see Decals below.

DECALS

These decals are as good as any available anywhere. For all types and roads, all freight and passenger cars, steam locomotives, diesel (road and switcher) and electric engines. Also plain alphabets, numerals, standard words and heralds. It would take a catalog to list them all. These are the former "Champion" quality line decals (now "Enhorning"). They offer a 49 page catalog for 50¢ which includes the above road paint jobs available, trucks and diesels. Order from: Enhorning Industries, 10143 So. May St., Chicago, Illinois 60643

PASSENGER AND FREIGHT CARS AND GENERAL S SUPPLIER

Code 100, 125 and .172 brass rail. Gargraves trackage and switches. Tru-Scale Milled and Plain roadbed, switch and crossover blocks. Ambroid, Kinsman, Arden and Regal freight car kits. Northern passenger trucks (six types). Northern passenger coach, baggage, also combo to follow later; also have Chester passenger car kits. Rex locomotives, Miller diesel bodies (power trucks later). Pittman motors. Superscale, Perma-Bilt, Stewart and Kemtron hardware and parts. **Plasticville "O" and "S" buildings** (see "Words of Wisdom" for conversion of "O" buildings). Ties, tools, taps, dies, machine **screws, brass and magnesium structural shapes and tubing. Northeastern woods, Floquil** paints. American Flyer parts and repairs. Diesel wheels for conversion from A. F. to scale. Power packs, rectifiers, transformers, electrical components and meters. Complete power systems built to order. Large A. F. stock, new and used. Will accept in trade any model railroad item regardless of age, make or condition. Send in for appraisal. **Complete information sheet on request. The Hobby Shop, St. Albans, Vermont.**

FREIGHT CARS

Want to get some real good car kits? Will also prepare you for scratch-building those other freight cars you have always wanted. Fifteen types of cars are available from Kinsman to give you all the practice you need and you will end up with a colorful array of top notch cars. The first kit is always the most difficult, but after that is under your belt, you will have been bitten by the bug. Going to build a hump yard? **Kinsman's sprung freight trucks are your answer to free rolling cars. Authentic in appearance and rolling qualities. If you are not familiar with the Kinsman quality-line** of kits, send a large stamped, addressed envelope to Kinsman Scale Models, 487 Swains Pond Ave., Melrose, Mass. 02176, for their catalog.

FREIGHT CARS

This firm produces good craftsman-type S scale kits, useable for either scale or **American Flyer trains. Cars consist of Northeastern wood and Stewart and custom** castings. A SAE will bring their catalog sheet. Regal Kits, 302 Hessel Blvd., Champaign, Illinois 61820 Phone 356-5254

FREIGHT CARS

San Diego and Arizona Eastern R. R.

The wood-side gondola is an exact replica with Northeastern milled wood sides. Side and end stakes fitted to pre-drilled and punched stake pockets of underframe and die cast base, including end steps, grab irons, hardware and SD&AE decals. For scale trucks or hi-rail wheels (specify which), $3.75, or for A.F. trucks with special underframe, $3.50. **At home on main line or work train. (Both less trucks and couplers).**

New York Central Boom Tender Car

The only kit of this type in S gauge. Same features as above, plus major scribed wood parts cut to size, cast metal windows and smoke jack, Northeastern scribed wood sides and ends. For scale trucks, $4.25, or for A.F. trucks, $4.00 (less trucks, couplers and decals).

Complete plans for craftsman or novice illustrated for ease of construction.

Trucks for above, Kinsman sprung, $2.50, or Rex, $1.00. Please specify scale or hi-rail flanges. (Add 25¢ postage on orders of less than $5.00, and 5% sales tax for Pa. residents).

Specializing in limited-run production tools, custom model work patterns, tool and production design. Will be pleased to quote on these. Queen Tool and Mfg. Co., 234 Long Rd., Pittsburgh, Pa. 15234.

SWITCHES AND FREIGHT CAR SIDES

Choice of 12 lithographed and engraved freight car sides, 60¢ a pair. Pre-colored dark cork roadbed, 56' for $12.50. Scale wye switches, $3.00. 18", 30, 45, 60 and 90 - degree crossings, $4.00-$5.00. Hi-rail built switches with fibre ties, $3.65; A.F. type on wood base, $3.65; strapped, only $3.00; wye kit, $3.00; single crossover kits, right or left, $7.00. Single-pole, double-throw controls for rotary switch machines, 60¢ each. Order from Star Hobby Products Inc., Box 53, Bronx, N. Y. 10471.

COUPLERS, RAMPS, TRUCKS, ORE CARS, SEMAPHORES, FIGURES AND CONVERSIONS

Kadee couplers converted to automatic "S Gauge", 2 pr. for $1.50, various types. Uncoupling ramps, 2 pr. for $1.20. Lost-wax cast reefer and passenger car wood beam trucks with aluminum wheels, $3.50 a pair (state scale or hi-rail). S scale metal lower quadrant semaphores, **brightly painted for CTC, $1.25 each or 5 for $5.00. Colorful** scale plastic, hand-painted figures, 18 for $2.00 or 36 for $3.50. Now for your steel mill, ore mine or dock, 75-ton ore cars for various roads, $3.50 each or 3 for $8.50, **postpaid. Watch "S Gauge Herald" (listing below) for later introductions.** Conversions done, SAE for list. Delaware Valley Kits, 3377 Papermill Rd., Huntingdon Valley, Pa. 19006.

BOILERS

For those of you who like sheet stock boilers, these are made any size or type (engine or stationary), of brass, copper, steel or stainless steel, for live steam or model use. For live steam, many are arc heliarc welded, all featuring super heaters. They have perfected a marine-type flue that gives quick, dry steam. Send sketch with dimensions for a price to Model Boilers, P.O. Box 178, Ventura, Calif. 93002.

USED AMERICAN FLYER EQUIPMENT AND REPAIR PARTS

Have S gauge parts from 1946 to date to help you. Also, used American Flyer S gauge equipment for sale; engines, cars, track, etc. Trains bought and traded. Send stamp for list to Dan Olson, 16150 41st Ave. N. E., Seattle, Wash. 98155. 206-363-3556.

A.F. REPAIRS AND USED EQUIPMENT

One of the largest Authorized American Flyer Service Stations in this area. Besides repairing, he has a good supply of new and used American Flyer parts and used **locos, cars, track and accessories (no p. m. fields). He has old and new style replace**ment light bulbs; please specify lamp number when ordering. Prices quoted for SAE. William Diesing Jr., 5718 Rhodes Ave., St. Louis, Mo. 63109.

WANTED, AMERICAN FLYER S GAUGE

Passenger train sets, diesel units (A-B-A), steam-type Hudsons, Pacifics, Northerns, civil war and circus sets, 1945-65, scale trolleys r-t-r. Also, Erector/Meccano. Railroad Memorabilia and Theatre Pipe Organ periodicals to swap or sell. Alden Miller, 3212 34th Ave. South, Minneapolis, Minn. 55406.

S GAUGE MAGAZINE

S Gauge Herald, published by S gaugers for S gaugers. It is the MUST magazine for serious S gauge model railroaders, whether beginners or experts. Each issue at least a full 32 pages of articles, pictures, regular features, new product announcements and advertisements to help keep you posted on all the newest and best in S gauge. Subscription for one year (six issues), $2.50. Outside USA, $2.75 in U.S. funds. S Gauge Herald, P.O. Box 105W, Oradell, N. J. 07649.

S GAUGE MAGAZINE

"The magazine that makes S swing!" Every issue contains S articles, hints, photos, NASG news and more. Keep up to date with S suppliers too by subscribing. Only $1.25 per year, which includes six issues (January, March, May, July, September and November). **The S Gaugian, Tolono, Illinois 61880.**

PASSES AND RAILROAD STATIONERY

"Railroad Printers", operated by an active S gauger, specializes in a professional style printing for model railroaders. Not only are their prices low, but they offer fast service. Passes start at $2.75 per 100. Letterheads and envelopes run around $4.00 for 250. Also available are beautiful, very realistic Stock Certificates (I have seen these and they are beautiful), Tickets, raised Printed Business Cards, and a complete line of Train and Trolley design rubber stamps. Their work has been pictured many times in the "Pass of the Month" section of the MMRA Bulletin, as well as **winning 2nd prize** at the 1964 MMRA National Convention. There are over 40 stock background cuts available as well as hundreds of type styles and type cuts. All are illustrated in the **present edition of "Printing for Model Railroaders", a catalog available free.** Prices and actual samples included. Write Francis La Prise, Pres., Railroad Printers, P.O. Box 74, Dorchester Center Station, Boston, Mass. 02124.

STATIONERY STAMPS

Choose from 29 designs of trains and trolleys, add three lines of wording for your name and address with zip code, and you have a rubber stamp for return address on your envelopes and to make letterheads. **Super-detailed trains from an 1890 passenger to mod**ern diesel freights. Four types of trolley cars. You may have your model railroad name or any three lines of wording in place of your name and address for the same price. **Sold throughout the U.S. and Canada and in seven foreign countries since 1959. Design** with your name and address or any three lines of wording, $3.00. Design only, $2.00. Postpaid in U.S. and Canada. Literature available showing most designs. Order from Charles H. Palmer, 26 Hanmer St., East Hartford, Conn. 06108. Dept. SCL.

SCRATCHBUILDER'S MATERIALS & TOOLS

Complete stock of raw materials and tools for the scratchbuilder. Brass sheet, wire, shapes; nickel silver sheet and wire; drill rod; plexiglas; acetate, Micarta, and styrene sheet; Lucite rod; Northeastern wood including S gauge car parts; complete Kemtron line including all S gauge parts; cements & glues; all soldering supplies; Unimats, NO-OX, etc. "Scratchbuilders Catalog" only $1.00. Craftsman Specialty Supply, P. O. Box 102-D, Rogers City, Mich.

Other Recommended Equipment

CAN YOU REALLY SEE?

Are you working on cars and engines, and wishing the parts were three times larger or that you could get a closer look at the work???

If you are aligning decals, scribing close lines, grinding off gatings, finishing brass or pattern work, filing bolt heads, reading small dimensions from a scale or vernier caliper, studying fine drawings, inspecting detail on photos, or, to sum it up, if you are a model maker or serious model railroader, we have the answer!

Magnifying Binoculars!!

Fitting around the head, even over glasses, magnifying binoculars give you effortless 3-D vision and leave both hands free, with parts appearing 2-3 times larger. A comfortable padded headband may be adjusted to your exact size. Unbreakable lenses are mounted in a hood which holds them the proper distance in front of your eyes, keeps out annoying side light and may be pushed up out of the way for instant normal vision.

With these Magnifying Binoculars you can work several hours at a time without eye strain. They will become the first tool on the bench that you will pick up when you start to work!

Now, you can start to do really prize-winning detail!

We cannot too strongly recommend these magnifying binoculars as the most overlooked tool to do better, finer work and to save your eyes. The 7" focal length is excellent for most model work.

Order at only $14.95 plus 35¢ postage from the NEST CO., 812 Olive, St. Louis, Mo. 63101.

Along with the above, ask for their jeweler's supply catalog of stainless steel lock tweezers, pliers, jeweler's files, loups and binocular glasses that clip onto eye glasses, etc.

BERNZ-O-MATIC SOLDERING TORCHES

This torch and its simplicity to use is a must for engine building, very much easier to use than an electric soldering iron, cheaper, and probably fewer burned fingers. Lights instantly with a flick of a match or spark lighter and a turn of the precision valve, which provides perfectly safe, small, very hot, clean, simple and dependable flame control, quickly changeable from small candle heat to a pencil size flame of 2300 F. degrees. Detailed instructions with the torch for many household uses. No preheating, pumping, spilled fuel or big, broad, frightening, bellowing flame, as with a gasoline torch.

BernzOmatic fuel cylinders are world famous and contain a self-sealing valve that pops shut when you thread off the torch unit, with no loss of the propane gas. No messy fluids. We have used these for years, and now as clean as the day they were bought. Large or shorty replacement fuel cylinders available for just over $1.00, good for assembling about 3 engines, or 8 hours work.

For our uses, Model TX10 torch with screw valve and cylinder, or Model TX65, has push-button control to instantly control size of flame, anywhere from economical pilot light to large 2300 F. degree flame; big enough to sweat boiler bands and parts, 4" copper fittings or small 1" engine piping and valves.

"Handi-Hand Torch Kit" model TX610, with cylinder, is a real handy model. Regular pencil flame torch in a fast "pistol" grip handle for quick, tough jobs. Fuel cylinder clips on your belt for work around the house, on gutters, plumbing pipes, or hangs up **over the work bench out of the way.** Between the pistol grip and the fuel cylinder is a 4' flexible hose extension, also useful for hard-to-reach work areas, or just workbench convenience. **Metal clip on cylinder holds torch head when not in use.**

Model TX888K Kit: All-Purpose BernzOmatic TX10 torch and cylinder with soldering iron tip, paint remover burning attachment, combination soldering table and heat shield and storage rack for torch and accessories. Contains kaowool - miracle heat-resistant ceramic fiber insulator used in space-age missiles. Heat shield may be placed under soldering on the bench, or behind work, such as when repairing or installing guttering, copper plumbing, etc. These parts, as well as other accessories, can be purchased separately. All I.C.C. and Underwriter's Laboratories Approved. Ask for BernzOmatic at your local hardware store.

ELECTRIC HAND GRINDER-DRILL

The Dremel Moto Tool is another must for the serious modeler. It holds drills too small for an electric hand drill. With cutoff discs, it cuts off casting gatings and **then smooths with sides of disc. Resharpens #60-#80 drills, cuts rail, switch points,** cleans off solder or cleans for soldering. Polishes with buffer. It will mill holes and irregular contours with old dental round and conal burrs (your dentist will be glad to save old ones for you, or $1.25 each from Dremel) by bracing both hands tightly against work bench. Sharpens small instruments. Save many, many hours of hard filing time with cutoff discs and burrs in small areas. You can also use burrs and discs to get into small areas and around corners to remove protrusions. Use larger burrs to rout wood or plastic, or a small circular saw to cut them. An attachment is available to put grinder in a lathe tool post to use as high-speed grinder ($2.50), or to make form tools, etc., or put in quil of vertical mill for high-speed mill. Small stand available for small drill press, $15.00. You will think of 1001 other uses too. Unless you will be routing wood or plastic, we would suggest getting the Moto Tool only, then get a mandrill or two at 35¢ each, for cut-off discs, package of cut-off discs, **$1.50; several sizes and shapes of grinders, 50¢ each.** Their rheostat, $9.00, is very useful to vary motor speed, particularly for #60-#80 drills. May we suggest, instead of the #2 Moto Tool at $19.95, that you get the #3 industrial, heavy-duty model with more torque and double power at $29.95. **(We have had two of them for a long time). For catalog or order,** write Dremel Mfg. Co., Racine, Wisconsin.

DRILLING AND TAPPING

Have you felt that with the next turn of the tap it would break? Now there is a solution to that, whether large or small tapping in steel, brass or even copper. A drop of "Tap Magic" on the started tap will very noticeably release the pressure, saving many broken taps, make them last longer and do the job easier. "Tap Magic" is also very good for easier power drilling and to extend the life of those small drills, #60-#80. It not only cools them, but prevents sticking and weldment caused by heat and/or pressure that breaks drills and taps, particularly at the high speed of electric hand drills that excessively wear the cutting edges of drills. We highly recommend and have used "Tap Magic" when drilling the 3255 .020" holes in our Berkshire tender's tool steel and brass dies, and lost only a few drills. From rule of thumb, one can normally safely drill about 5 drill diameters deep. "Tap Magic" will extend that to about 7-8 diameters. Except for aluminum, it gives better finish to all metals, requires less tool sharpening, provides truer size holes in drilling, reaming, boring, broaching, tapping, threading, turning, milling, sawing and engraving. "Tap Magic" is not a cutting oil, not flammable nor explosive and leaves no oil residue. It is available at all machine tool supply houses or large hardware stores. If not available in your locality, send $1.00 for 4 oz. can, to The Steco Corp., Box 2238, Little Rock, Arkansas.

STEREO RECORDS

Bring back those beautiful, forever gone sounds that we all like and model from; steam, diesel engines and their whistles. Sounds your children have never heard and would be delighted with. These are very good records that we can only very briefly de**scribe in part from the few we have, in the small space available.** "Ghost Train" has our NKP Berkshire #779. We particularly liked *"Thundering Skies", in which you felt you are actually in a thunder storm (safely). **You can even hear water very realistically dripping,** as though in the next room, with the engines thundering and whistling on. *"Highball" has some narration by Jim Ameche to differentiate between engines and locals such as "Big Boy", U.P. heavies, the "Daylight", husky close-up of an engine slowly chugging under heavy load, and a heavy Northern straining, slipping several times under load, then pulling on. *"Hear That Whistle Blow" has several long engine runs with beautiful whistle artistry. *"Remember When", a very good long run of close staccato of steam exhaust slowly increasing as speed picks up. Includes NKP S-1, practically our same NKP S-3, #779. **Several slow, long, hard pulls, with heavy chugs.** ***Sunday Only",** of the Burlington Route, includes a double header, another passing at 60 mph and numerous calls from the "Banshee Screamer" whistle. **"Mr. D's Machine" gives many good angles** of diesels thundering up, by, across, idling and many blows of the horns.

You might consider a cheap, used record player with a speaker near the center of your layout for much more realism at scale sound level for such records as "Thundering Skies", "Remember When", "Hear That Whistle Blow" and "Sunday Only", all of which have some long hauls. You could run your engine according to the record, even if both are not perfectly synchronized. Much realism will be added from the effect of the sound, even if no engines are running at all.

These records have very quiet backgrounds because of Polymax, 100% static-free, anti-dust collecting, long life and quiet material. **StereOmonic sound gives better mon**aural than regular monaurals, as well as stereo. We put an asterick (*) ahead of the records that we liked the very best, but your choice may be different. **Records are 12",** 33 1/3 rpm and $4.79 each, 4 for $16.77 or 5 for $19.16. Order from: Mobile Fidelity Records, P. O. Box 336, Burbank, Calif. 91503.

"UNIMAT" LATHE

The lathe is the most useful and first machine to get for the shop, as it can be used for not only a lathe, but a drill press, and with a milling attachment, as a vertical mill (as on it's side), to lay our exact locations for drilling, for layout and as a small press for pressing and quartering of drivers and wheels. The "Unimat" does all this directly and has long been known as a modeler's and professional lathe, and is used by many large machine shops for small precision and experimental work. The basic lathe, at $139.50, includes motor, tool post and cutting tool, steel vertical column (for drill press and vertical mill), head stock adapter, 3-jaw chuck, Jacobs type drill chuck, grinding wheel arbor, face plate, lathe dog, 2 centers, spindle feed (for vertical mill), wood storage chest and miscellaneous parts. This is more equipment than that which comes with other lathes. "Unimat" has several unique features for flexibility of use. The most important is the quick, 360 degree rotating and detachable head stock that allows the head to be mounted on a vertical column for drill press, vertical mill, horizontal mill, surface grinder or electric hand drill. In the normal set-up as a lathe, it can be used as a bench grinder or polisher too. The spindle is moveable 5/8" for drill press or mill use and has 11 speeds. Over 100 attachments and accessories are available for hobby or complete professional metal work. **Among these are:** indexing and dividing attachment, block to raise head and increase swing of work from 3" to 4 7/16" over the bed, polishing and grinding accessories, 45" flexible shaft for grinders, drills or mill burrs, $16.95, buffing pad, wood turning rest, $1.75, 4-jaw independent chuck, $22.50, collets, draw bar, centers and ball-bearing centers, grinding wheels, arbors, cross-slide vise, $7.95, mill table, $10.95, steady rest for turning long pieces, $9.75, power feed attachment, $19.95, magnifier stand, jig and sabre saw, $14.95, table circular saw to accurately cut strip wood, channels, etc., $14.95 (both saws will cut thin brass), and thread cutting attachment. **It should be remembered, too,** that not only can parts be made directly with these set-ups, but also various fixtures, jigs and dies for stamping, bending or making many duplicate parts fast - work which in 'tself can be intriguing as well as useful.

The ball-bearing spindle is guaranteed to have not over .0005" runout for precision work. 900 to 7200 rpm. Swing over the bed 3", 6 9/10" between centers. Head stock rotates 360 degrees with ¼" spindle hole. Carriage travel 6½", cross slide travel 2". Overall dimensions 14½"x4"x5". Now even the amateur machinist can have a complete machine shop for convenient home or apartment use. This lathe will make most any parts that you will ever want for any gauge, and at a modest cost in comparison to other equipment. Write to: American Edelstaal, Inc., 350 Broadway, New York, N. Y. for complete catalog, or add $1.00 for their fact and photo-packed manual, "Miniature Machining Techniques" - one of the only handbooks available for doing small precision work.

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Useful Articles

Soft Soldering

A Bernz-O-Matic propane torch from the hardware store is by far the best for building a brass engine because it produces quick, variable heat from candle heat to 2,2000 F., able to melt small brass wire and hot enough for silver soldering. It should be understood that these torches, properly handled, are quite safe. These torches do not have a large, bellowing flame such as a gasoline torch, but a small, quiet pencil-size flame. They require no pumping nor can the fuel be spilled. You just turn the valve until you hear the hiss of the gas and instantly light the flame with the friction lighter supplied with the torch, or with a match. Adjust the valve for desired flame. Before attaching nozzles or lighting the torch, carefully read the instructions on the torch kit and follow them.

To attach pieces such as domes and stacks, lightly file both pieces to be joined together, to clean them and to provide a good fit. It is sometimes helpful to tin both pieces with a soldering iron so that the excess solder will fill the cracks and form a fillet when the torch is applied. Otherwise, put soldering paint on both surfaces to be joined, put the parts together and apply heat from the torch. Generally apply a good amount of heat to solder quickly before the heat travels to another part.

Use soldering paint almost exclusively. Not only is the solder and flux together in a thick liquid for convenient use, but the flux acts as an indicator by turning black when the solder has melted. This is particularly useful when soldering very small items such as 1" piping in valves. **When a joint cannot be seen, it is helpful to apply** a spot of soldering paint on a visible surface of the part as an indicator of when the solder has melted at the joint. The resulting thin coat is invisible when painted. Soldering paint is also much cleaner than solder applied with an iron. With an iron, solder must be bridged between the iron and the part, to transfer the heat from the iron to the part. **This always leaves a blob of solder. If the part has small detail,** rivets, nuts, etc., these can be covered with solder, requiring a great deal of filing for removal. This does not happen with solder paint and the black indicator residue is quickly dissolved with water and a brush.

The solder in soldering paints settles to the bottom of the jar. The instructions recommend vigorous stirring before use. I prefer instead to mix a drop of the sediment **with a drop of the top liquid using the top as the mixing bowl to get the thickness** of solder I want for a particular job. A drop or two is all that is needed for joining several parts. A medium-thin coat works well for most well fitting parts; medium-thick is best for most general soldering and very thick where cracks are to be filled. If fillets are needed, a second application of very thick solder should be used with adequate heat. Do not be afraid to use a fairly thick mixture as it thins and spreads when melted.

Generally, you will want to put the heavier, larger parts on the boiler first, such as stacks, domes, etc., since these require the most heat for soldering. **Then the** smaller parts and gradually the smallest parts should be added, in each case requiring **less heat, preferably not enough to unsolder the parts already fastened.** For example, attach pumps, domes, stacks, heaters, cab to the boiler first. Then add the sander blocks to the sand dome, fitting in all at once, then add soldering paint. **Solder them** all at once with a quick application of heat which should not loosen the dome. Similarly, put all sanders in the blocks, propped or held in place with scrap metal if necessary. Put wet swabs on the sander blocks at the dome so that they will not come loose, and solder all the sanders at once. Alternatively, the sanders could be soldered one at a time by applying wet swabs successively to each sander after it has been soldered before moving on to the next one. **Similarly, put wet swabs on the sanders at the sander** blocks and add the piping. It is quite simple to add several pipings to a part, such as the injector, by the similar treatment of putting a wet swab on each soldered pipe or by wrapping it with wet string before soldering the next piping.

To free hands of torch, sit bottom of cylinder in your lap, with side resting against work bench, or lay cylinder flat on work bench with nozzle sticking up or to the side, or out over the edge of the work bench.

These wet swabs of cotton, Kleenex or even toilet tissue are the key to fairly easy engine assembly, as they will fit readily around any part to keep it cool while soldering is being done nearby. It is important to be sure that the wet swab covers any exposed solder joint. They may steam but if they start to smoke or burn it is an indication that they have dried out and are no longer cooling. At this point they should be removed and resoaked. Before they are completely dried out, an eye dropper can be used to squirt on a few drops of water. Once they have thoroughly dried, they will not readily absorb water in this manner. Any time you want to solder when there is another part nearby which would come loose, use the wet swabs on the nearby part. If you want to add a part which is surrounded by a number of other parts which might loosen, surround the whole area and these parts with wet swabs, leaving only the small area exposed for the part to be attached.

Whenever attaching small parts, such as a pipe clamp and its piping to a boiler, to heat the part and the boiler at the same time sufficiently to melt the solder on the boiler would undoubtedly melt the piping and/or clamp. In this case, put some soldering paint on the boiler at the proper spot, possibly also tinning the underside of the part with an iron. Then preheat the boiler until the soldering paint there turns black, wipe off the black, add more soldering paint, very thin, put the part in place and hold there with an ice pick, adding the heat of the torch around the part, preferably not on it. The stray heat will heat the part sufficiently. Here, as with other situations near other parts, you will want to use a lot of heat from the torch to heat the area **quickly before the heat has time to travel to other parts.** This quick heating and preheating technique is probably not used generally to its fullest advantage. Remember, as soon as the paint on the part turns black, remove the torch immediately.

Adopting these methods, piping can even be soldered to both ends of small pipe valves easily. **Put soldering paint on both ends of the starter holes of the valves,** put piping in one end, hold one or the other with tweezers (preferably stainless steel with locking rivet) and solder with a very small flame of the torch, just until **the paint** turns black. Then wrap this end with wet string and holding the valve with the tweezers, add solder paint to the other piping and the valve hole again. Put the piping in the valve hole, apply a small flame again just until the paint turns black and quickly remove the heat. It is often easier to do an assembly of this kind separately on the bench and then add the entire assembly to the engine.

There are varying methods for holding parts together while soldering. When possible, position the boiler so that the part to be added just rests in place on the boiler by itself while soldering. Some pieces have to be held in place with an ice pick while soldering because of the odd shape or because the vapor formed by the melting solder from the soldering paint causes the part to move. If parts move after soldering, **the tip of an ice pick can be used while the solder is still melted to reposition** the parts. Some parts have pins on them. With these, slightly undersized holes can be drilled in the boiler, and the part, after applying soldering paint, can be tapped lightly in place or thumb-pressed in place and then soldered. These parts should of course be installed first of all. Other parts without pins could be fitted with pins (wire) pressed into the part and then similarly fitted to the boiler or to another part as required.

An example of this would be the boiler front. You would first attach the parts with pins in them. Center punch locations of the holes to be drilled in the boiler front so the drill will more easily start in the right spot. Drill hole one drill size smaller than the pins. After applying soldering paint, push the part into the hole. Lay the boiler front flat on the bench and put the loose parts, such as steps, in place. Then solder these all at once. **Next, position one number board in the proper place and** hold it with an ice pick while torch soldering it on. Cover this one with a wet swab and similarly solder the other one. On the first trial you will no doubt see that they are not quite square so you will have to reheat one or the other. Hold in place with an ice pick and reposition with another ice pick or strong wire held in the same hand as the torch, or using the tip of the torch to move the part when the solder is melted. If you should drill a hole for a pin which is a bit too large, you can mash the pin to flatten it and make it wider or you can pean around the hole to make the hole smaller.

Some very small parts which are under some strain or which do not have enough surface for a permanent hold, such as a small pipe clamp on the boiler, or the ends of the boiler bands, can be pinned on after attaching them temporarily with solder. You can **drill a hole an appropriate size for the part, through the part and into the boiler a** depth of three or four diameters of the drill used. The top of the hole in the part should be bevelled with a center drill or a drill five sizes larger than the hole. This permits the pin to be mashed out. **For very thin sheet stock, with the edge of a small** screwdriver or similar tool, mash down the edges of the sheet stock around the hole in several places, then push in a tight fitting copper wire as a rivet, leaving it sticking up above the part about one or two drill diameters, then rivet it down with a small ball pean hammer. This will work better than a flat hammer. Copper is used rather than brass as it is softer and peans down easier. **Brass tends to bend over. Surplus material** which cannot be mashed down into the hole can be filed off smooth.

When using the torch close to the running boards, coat them with swabs. With any heat they will tend to arch, but unless covered with swabs, they will warp so much that they will have to be removed from the studs and resoldered. With proper swabbing they should return to normal shape when cool.

For certain jobs soldering paint will not provide sufficient solder, such as at cab and tender corners. **In this case drop small beads of solder into the corners. It** is usually best to first tin the corners with a soldering iron. This is one of the few uses of a soldering iron. The torch can be used for tinning an area but it is harder than with a good heavy iron. When using a torch for tinning, a sliver of wood is useful **for spreading the solder after applying flux and heating with the torch.** Pine wood seems to be the best. A better method yet is to preheat with the torch and then use the iron for spreading the solder. **This technique can also be used for tinning** larger parts when your iron is too light, such as the tender and engine frame, the cabs, bottom of dome, etc.

Always be sure that parts fit well together, with no burrs in between, before soldering. Also, after a good cleaning, be sure the parts are well soldered and not just tacked together. Otherwise, they may come loose later after painting and be more difficult to repair.

If torch soldering is new to you, it may be a good idea to read these instructions several times over a period of time so that you will not forget some particular technique. We are considering purchasing a soldering iron tip for our Bernz-O-Matic for all wire soldering since any amount of heat can be applied quickly without a long delay for heating. **Also, there is no long cord trailing to get tangled up. Considering the cost** of electric irons and the cost of Bernz-O-Matic fuel cylinders, torch soldering is probably cheaper. **Possibly even a second Bernz-O-Matic would be handy and in the long run** the only extra investment would be the torch itself as the fuel lasts forever when not in use.

Silver Soldering

Silver soldering may have a place for some of you died-in-the-wool scratch builders and pattern makers. One big advantage to silver solder is that once soldered, you can silver solder other parts very near or even on top of the silver soldered part and unless you are very rough, the first part will not move easily as it would with soft soldering. After a joint has been heated several times it is difficult to remove the part, and for drilling and tapping procedures, you have the equivalent of a one-piece part as contrasted with normal soft soldering.

Silver solder is available at many welding supply houses. I prefer to use the lowest or near lowest melting point solder of 1,041°, of either .010" thick sheet cut in 1/16" squares, or 1/32" wide strips or .010" wire cut about 1/16" to 1/8" long. About $1.00 worth of solder and $1.00 worth of flux will last you probably forever. This is also available in a soldering paste although I have not used it.

With your Bernz-O-Matic propane torch you are restricted to using silver solder on smaller parts of such sizes as the Miller muffler, valve gear parts, heaters, small **domes, etc., since the parts must be heated red hot. The torch cannot heat to red hot** larger parts such as large domes, boilers, trucks, etc. For the larger parts within these limits, do not lay them on a metal plate for soldering as the plate will absorb too much of the heat. Put a piece of asbestos, available from a hardware store, between the part and the metal plate. Alternatively, a part can be held with stainless steel lock tweezers (steel tweezers will bend), the latter laid on a brick and a piece of metal laid on top to hold it down with the part on which soldering is to be done sticking out. **Then the part to be added can be laid in place on this and soldered.**

To avoid cracks after soldering, parts should fit together with no more than .005" spacing, as silver solder melts as thin as water and will not fill a larger crack. If a crack has to be filled, it will have to be filled with soft solder as a later step. Both parts must be filed shiny clean, with flux on both pieces. Flux can almost be water thin, with no lumps. Put the pieces together, then lay several small pieces of solder (described above) around the joints at the cracks. I prefer this method to putting the solder between the parts as sometimes the parts will not go completely together. When **the solder melts, it will run into the cracks by capillary action.** Heat the parts with a torch to a dull red heat, preferably rather quickly so the flux is not burned up. First play the torch slowly over the flux to remove water so that the silver solder will not pop off, or you can hold the solder in place with the burned end of an ice pick (if the point is burned, the solder will not stick to the point later when it melts). The flux will first form little balls and then suddenly spread like water. This is the point at which the solder melts. Since the solder melts to the thinness of water, it will quickly spread to nearby cracks, concave corners and rivets. Sometimes the solder will not spread but will form into a ball when melted, so use the end of the ice pick or the solder might stick there instead. Silver solder is very poor for forming fillets since it thins so much and quite a bit would have to be used. For fillets

I usually file the corners clean, fit in a piece of scrap brass and silver solder it in, and then file the fillet, or use soft solder for a fillet if it would hold up for later use. If you heat too long, silver solder gets quite hard and difficult for later filing smooth, so make the joint quickly. If you do not get a good joint as a result of too long heating, usually the addition of more flux and reheating with more silver solder will cure the problem. If not, you will have to refile both surfaces and start all over again.

After soldering, the joint will be clean from the flux, but around the joint it will be a dull, dirth color. While cleaning is unnecessary, you can brighten it by dipping the whole piece in the flux and heating again until a dull red. However, if the joint is close to some other crack, concave corner, nuts or rivets and you use quite a bit of solder for the joint, you had better forego this procedure as the solder is likely to run. Sometimes there is a crust, probably from incomplete burning up of the flux. This can be removed in a solution of 15% hydrochloric acid in water, soaked about an hour, and then chipped off.

If you have an area near the joint you are soldering which you do not want the solder to spread to, try coating the area with a thin coat of grease containing a lot of graphite (from a hardware store) or with a thin coat of dirt or clay in water (a thick mixture) or scribble over the area well with a pencil.

Notes: if there is soft solder on a joint to be silver soldered, the silver solder will mix very readily with it. Some experimentation here may reveal a lower melting point for the silver solder preparation, still well above the soft solder melting point. Also a soft soldered joint when heated almost red hot will make the soft solder very hard and difficult to file. This may be a clue for something too.

When you get proficient, you might try small fillets, it is a very ticklish job. After part has been soldered on, place a bead or 1/32" silver solder wire along proposed fillet area. Then with torch flame set just to barely melt the solder, play flame over solder, fillet area and tip of ice pick to heat it. When solder starts to melt a little, prod the solder down into the fillet area, at the same time pulling back torch to just hold even temperature on work. Prod solder over area to fill in, maintaining solder in puddy consistency. Do not expect a smooth fillet, file the shape. Do not allow the solder to melt, or solder will run everwhere. Try to work a bit cool, prodding solder in place.

EPOXY

Epoxy can be very useful in engine building and repairing, or even for use on cars after painting. It is particularly useful for upgrading American Flyer engines or other engines with Zamac (die cast) boilers that cannot be soldered, using first class detailed parts that cannot be cast on. In building a brass engine, you can practically attach all parts to the boiler with epoxy if you wish, or at least some of the last pieces where soldering would loosen pieces previously attached. For general use of epoxy, the manufacturer's instructions are good but the following will greatly improve results.

Epoxy is not difficult to use nor dies it have to be mixed in exactly the proportions stated. Most epoxies call for equal parts of resin and hardener for average use. However, for harder epoxy use a bit less hardener. For flexible joints, use a bit more hardener such as for use on sheet stock, plastic, leather, etc. Mix the resin and hardener thoroughly, then rub the mixture into each surgace for a couple of seconds. For best results, the entire area of both surgaces should be 1/32 of an inch or less apart, and the mix should be used within one-half hour. Some parts may not want to stay put and may slide or fall off because of their position. However, when the epoxy on the parts gets tacky it will hold the part in place. If fillets are wanted, allow the epoxy to get putty-like, then apply. Save what is left over so you will know how hard the epoxy used has gotten. Any epoxy that is squeezed out around a joint can be removed with alcohol and a cloth.

As with soldering, surfaces must be clean. They should be freshly filed with a course file or preferably ground with a rough, oil-free grinding wheel, the rougher the wheel the better, such as the grinders supplied with your Dremel Moto-Tool. Filed surfaces can be sctatched rough with a scribe. In any case, do not touch the surfaces with your fingers. A joint can be made stronger where the cementing surfaces are small by drilling a hole through both pieces and pressing a rod through both pieces and epoxied. Alternatively, fill the holes with epoxy, which acts like a rivet and creates a greater cemented surface area.

After use, wash hands thoroughly woth soap and water if you have sensitive skin. There is plenty of time to come back and do more, as epoxy does not dry but sets gradually, taking a long time. Because it does not shrink, it is good for making fillets and for filling cracks and crevices, and forming shapes as it starts to set. We have not found any to get as hard as glass, so it can be drilled, tapped, machined and carved and used for a coating against oil, water or acid, insulation on metal and wires. A drop or two of alcohol per 2-pea sized mix can make a paint (use a bit less resin) experiment.

It seems to set upstairs more quickly than in the basement, unless set over the furnace. Best setting for us has been over the refrigerator where the air is warmer and possibly drier. For best results, after the first hour of pre-setting, put it in an oven at about 130° for three to four hours of the objects being cemented will tolerate that heat. At room temperature it will start to stiffen in about one-half to one hour sufficiently for you to do additional work. Hardness is reached in 24 to 48 hours and peak hardness in about a week. Experiment with the conditions of temperature and humidity in your own home for peak results. As you have gathered, nothing is critical.

Epoxy is not a complete substitute for soldering, but it is the next best thing, particularly when working with Zamac. Samac to Zamac joints can hardly be pulled apart unless there is great leverage. Zamac to brass is not quite as good, nor is brass to brass, but adhesion is acceptable. We have had number boards epoxied on one of our engines for a long time with very satisfactory results, and these have a rather small joint area and stick out quite a bit.

Epoxy can be used not only for engine joints, but also for anything else where glue is normally used but where you want a stronger joint, such as in attaching coupler pockets, replacing tires on drivers, loose axles on drivers and wheels. You can clean both surfaces with alcohol or lacquer thinner. It can be used for replacing parts on engines and cars where heat would make a mess or for joining dissimilar materials, such as plastic to brass or Zamac, or wood to brass, or add more detail after the engine is painted.

Whether soldering or epoxying, now is the time to build your engine. Nothing ventured, nothing gained.

WHEELS and DRIVERS

There has been much discussion as to which metals are best for "electrical pick-up" in engines, tenders and cars. We will not go into this too deeply, but rather, pass on some thoughts, facts and opinions whidh you may adapt to your own conditions.

First, one common problem has to be understood and a comparison made between metals. All metals pick up well when wheels and rails are very clean, but arcing still occurs between rolling wheels (even though you cannot see it) and this creates an oxide deposit on the wheels. Aluminum oxide does not conduct electricity and is therefore an insulator. Brass creates some oxide (a poor conductor too), but not nearly as bad and it generally wears away. Nickel silver and steel oxides are conductive so continue to pick up current. We do not know much about the characteristics of NS. All of these oxides keep building up, but steel powders and readily wears off unless some oil is present. Steel probably creates the least oxide since it is the hardest metal.

The most important factors are dust, oil and the oxides that form, and probably few of us can keep the dust and oxide low. Dust between the wheel and rail compounds the arcing so that you can see it, accelerates the oxidation process and creates the problem of burning and pitting wheels. Burning and pitting aggravates the already bad oxide problem by making the treads rough and more susceptible to dirt and oil than smooth treads. The formation of gunk (mixture of oil, dirt and oxide that forms soft scale) becomes an insulator which must be scraped off. If journals are oiled too much, smoke units run over or you get the engine wet with oil, the fluid will spread to drivers and rail. This becomes a vehicle that holds dust and oxide to the treads.

It is our opinion that NS is best for car and tender wheels since it gives the most positive pickup under all conditions, does not rust and the oxide is a conductor. Therefore, pitting that is conducive to oxide and gunk formation will be reduced. NS is probably one of the worst metals for locomotive driving wheels since tractive effert is important and NS will polish smooth.

Steel would be our second choice if the layout area is dry and equipment used regularly. The oxide (rust) is conductive and quickly wears off. Steel, being the hardest metal, does not pit, get rough or pick up dirt and gunk. Some say that steel runs cleanest, and they like the sound of steel wheels best (both for freight and passenger service) over switches and rail joints. Regular use of all equipment and proper journal lubrication will spread a very light oil film over the wheels. This prevents rust but is not enough to effect the formation of gunk. Moth balls or an oil-dampened cloth reduces or prevents rust on equipment in storage. Axle oil spreading will generally take care of rust on operating rolling stock, as the amount needed is extremely minute.

Brass becomes a good choice if your conditions completely exclude steel. Steel tires are no doubt the best for engines and tractive effert, best on brass rail (probably good on NS too). Brass is the all-time favorite as it does not rust, although its oxide will accumilate with minute amounts of oil to form gunk. The oxide is a poor conductor, but the engine weight will cause driving wheels to clean themselves. Pitting is not much of a problem except where excessive current causes arcing. This produces flicker in car lights and aids the build-up of gunk. The tractive effert of brass is fair to good, although it polishes like NS, tho not as much

Aluminum and Zamac tie for being the poorest conductors. The build-up of dirt and gunk which causes arcing and pitting is due in part to the softness of aluminum and the insulating quality of the oxide. The wheel is further insulated by picking up more dirt, thus more arcing. Zamac operates in much the same fashion, although it is a harder metal composed of zinc, aluminum, magnesium, antimony and copper. A problem not fully understood with aluminum, particularly on engines and tenders, is that clean wheels may operate perfectly if run every day, but if allowed to sit about a week, will hardly run until the oxide is worn off. There is apparently not enough current draw through the wheels involved to create heavy oxide, but gets worse as it sits for a time. We do not know this effect on cars, but some say that aluminum for passenger cars with low current draw is O.K. Of course they should never be used for engines or tenders. Aluminum and Zamac could be used for Pilot and Trailing Trucks, but we feel the lower the current drawn through each wheel the better. This reduces oxide formation partially caused by the medium to bad dust conditions of our rails. The trucks can spread the current over two or more wheels. For example, if an engine and tender has 15 pick-up wheels, it would probably run well even on a dusty layout because some of the wheels would be making good contact with the rail. With so many wheels there is less current per wheel, consequently less arcing and pitting. The same is true for passenger cars where all-wheel pick-up trucks are designed to reduce the flicker in lamps. Remember, too much current is as bad as dust. One side pick-up is best for tenders because the heavy current drawn through the journals and spindles will burn the spindles and lubricant. This does not happen in passenger car journals with their low current, even for all-wheel pick-up.

On one locomotive traction experiment, we deeply scratched all clean driver treads from side to side. We latter ran the engine back and forth over a section of rail containing oil, dirt and brass filings until gunk had built up on the tires. This gave considerably more traction than the scratches (Note: conductive brass filings were used in the gunk and on a heavy engine). This shows that gunk does increase tractive effort. Steel or NS oxide would probably give similar results to brass filings.

This dissertation is probably not final as some will agree and others will not, but it is food for thought. Your home conditions, cost and availability will predetermine performance. You at least have a choice.

"WEIGHTING" OR "LEADING" A PAINTED BOILER

Probably all engines should be partially "leaded" for better traction and less derailment. In practice, the word is: "the more the better", up to the point that handling becomes dangerous to the small parts on the engine. It is better to weight enough that when holding the engine the drivers slip when drawing max. rated motor current.

In general, smaller engine boilers should be fully "leaded". For drawbar pulling contests, larger engines such as Berkshires, Pacifics, Mikes, etc. are sometimes fully "leaded". Usually, larger engines are "leaded" only from the middle drivers forward to concentrate weight on the front drivers. This arrangement seems to make the locomotive less prone to derailment. Or engine should balance half way between first and last axle.

"Leading" can be done very simply without blistering the lacquer or loosening the soldered castings. It is best done after the engine is finished so that less heat is needed to attach boiler parts and to minimize destruction from extreme handling during building.

Construction:

The following procedure is used for "leading" cast boilers which are rough inside. The interior surface of boilers constructed of smooth tubing should be crazed so that the lead will adhere, either by deeply scratching with a large file or by using the end of a large drill or end mill in a drill press, lathe or vertical mill.

After determining the portion of the boiler you wish to "lead", cut a piece of corrugated cardboard and adjust it to fit tightly in the opening at the appropriate angle and location.

If wiring for a headlight, install a brass or aluminum tube as a conduit for the wires. Insert the tube through the cardboard, holding clear of the motor, and extend it to the boiler front. Excess tubing can be ground away with a Dremel hand tool after the "leading" process is complete. Insert paper plugs in each end of the tube to keep out the lead.

Remove the cardboard and wet well, but do not soak so that the rigidity is lost. Then replace in the desired position. When the entire boiler is to be "leaded", assemble the frame, motor and boiler and adjust the cardboard so that it fits snugly against the motor. The thickness of the cardboard provides ample clearance between the motor and lead.

Remove boiler from the frame and wrap with several layers of very wet terry cloth (Turkish) toweling. Plain cloth or handtowel does not work well as it transmits heat to the hand much too quickly. A towel draped over your arm and hand will afford added protection. Hold the boiler at eye level and at arm's length to guard against splattering. The boiler should be tilted at a 20° angle when pouring, thus breaking the weight of the falling lead and allowing it to splatter onto the wet cardboard and solidify. Pour about two tablespoons of lead into the boiler front at a time. When the lead has solidified, repeat the process until the cardboard and the cracks between the cardboard and boiler are completely covered with lead. Do not pour more than one-half inch of lead into the boiler at one time (one-quarter inch for sheet stock boilers).

To speed up the "leading", squirt two eye-droppers full of water on the hot lead. The water turns to steam and quickly causes the lead to solidify. DO NOT add a third dropper of water as it won't evaporate and will cause the next pour to splatter wildly.

Continue the one-half inch of lead and two droppers of water until enough lead has been added, leaving ample space for boiler front and wiring. If the boiler should get too hot, lay it on the towel until cool and then continue as before. DO NOT LAY BOILER IN WATER.

Remove cardboard, and finish assembly of engine.

In addition to the above, the following are also recommended to help the novice build engines, especially the ones preceded by *.

As previously mentioned, you should learn to build engines, not only because you are a modeler, but the reward is great. Not only are 'Ready to Run' engines always much more limited, but by being able to build engines from parts, you have a much, much wider range of engines that you can have in your stalls, and at a much cheaper cost for the same quality. (Note; Building engines from parts is much easier and different than scratch building.)

All of the following are from "Model Railroader" magazine, which are available directly from them, or from theirs or "Railroad Model Craftsman's" classified ads.

*So You Need a Lathe	Feb. 67, p-56	Silver Soldering	Sept. 67, p-31
*Scratch Build Your Own Frame	Jan. 67, p-48	Smooth & Quiet Drive	Aug. 66, p-30
*Drilling and Tapping Holes	Jan. 67, p-71	Soldering Fluxes	Mar. 66, p-61
		Gears and Gearing	Feb. 66, p-61

Words of Wisdom

We feel the following items are so good that they would be of great benefit to most of you. Items followed by "mr" are wholly or partially through the courtesy of Model Railroader magazine.

1.) Plastic Envelopes can be made from medium or heavy plastic sheets such as those used to package clothes (shirts). building materials, magazines and hardware equipment. Dry-cleaning plastic is much too light. If there is printing on the plastic, alcohol or thinner on a cloth will rub it off (CLOSE BOTTLE and REMOVE the cloth for further work). The easiest method of cutting the plastic is to retain one folded side of the origional bag and cut the width as needed. A bit harder method is to cut the plastic double the necessary envelope width and then fold. In either case, place the plastic between two boards, preferably even with each other, and with the open (cut) edges protruding about 1/16 of an inch. If plastic sticks out 1/8 inch the sealed edges will be rough. Run the flame of a Bernz-O-Matic torch along the open edges, pointing upward, or downward. This will firmly melt the edges together and give you a long plastic tube. The tubes can be cut to desired lengths and then placed between the boards again to seal one end. The time required to fuse plastic is too short to burn wood. Metal could be used instead of wood but this is not necessary. Since the heat required is so low, you can even seal parts in the envelopes by putting a narrow strip of wood on top and hold it down while using the torch. This will prevent parts inside from rusting, gathering dust or scratching. Even cars and engines could be packed this way.

While untried, we are sure that a geared wheel (such as a clock gear, etc.) bolted to a piece of metal, and with a width of 1/16 to 1/8 inch, could be used to seal plastic sheets. Place the two boards so that the bottom one protrudes past the exposed plastic sheet. By experimentation, heat the gear to proper temperature and roll it across the bottom board, using the top one as a straight edge. With this method, a whole envelope could be exposed and the gear run down the middle, parting the envelope in the middle. An ungeared wheel has been tried without much success.

2.) Rust-Proofing --- Place moth balls or a lightly-soaked cloth with new, clean motor oil (do not use a dripping wet cloth or used oil) in tool and parts drawers or with equipment stored in boxes and bottles. Used oil may cause rust on a part. A kerosene soaked cloth may be used in bottles. All of the above methods are better than emersing parts in oil. Brass parts may be kept brighter longer by putting them in small bottles, plastic boxes or bags. Parts and engines could be sealed in the bags described above. A very thin coat of epoxy rubbed on steel, then almost completely rubbed off helps too.

3.) Light Lathe --- For very small turnings, particularly in brass, or turning smaller and flatter heads on screws, place an electric hand drill in a vise and chuck up the small stock. Then use a file to turn down the desired shape.

4.) Tie Dye --- Two tablespoons of instant coffee per cup of boiling water makes an excellent dye for ties or other creosoted timbers. Allow about two hours for soaking. Color darkens as timbers dry. Vary shades of the ties to duplicate ageing. mr

5.) Unknown Dimensions of a part on a locomotive or car can be very accurately determined if the picture or plan is perpendicular (square) as you view it. By 'picking up a dimension' from a part whose measurements are known, construct a scale from it on the edge of a piece of paper. An 8x10 size is almost a necessity when using photos. On plans there are other demensions which may be used to make a scale when particular dimensions are not given. When using photos, reference may be made to plans that have one of the photo parts on it (with dimensions), and a scale made from this.

Some common constant demensions are; freight car wheel tread diameters, 33"; passenger treads, 36"; normal height of coupler center line above rail head, 2'-10". Ladder rungs and grab irons on freight cars are generally about 18' apart and 16"-18" wide (for 1890 cars, 24" wide). Modern box car floors, 44" above rail head (1900 era, 48"); flat car floors, with metal underframe, 42"; reefer floors, old and modern, 48", Brake wheels on modern equipment are usually 22" diameter and set 18"-19" to the left of the car's center line. If the photo is clear enough, you can see the car demensions stencilled on the side over the truck. If the following symbols are shown, they mean: IL, inside length: IW inside width; IH, inside height. Since all are inside dimensions, you must add 12" for outside dimensions. In addition to some of the above data, you will generally know the coupler height and driver diameter of locomotives. If one end of the vehicle pictured is nearer to you than the other (that is, in perspective), a more complicated method is needed to determine dimensions. mr

6.) Making Rocks --- Sometimes it is easier and more realistic to make large sheets of rock on the workbench. Desirable types might include shale, broken or blasted rock and rock mortared together for wall use. Whenever needed, they can be sawed in the necessary shape, such as for chimneys, tunnel portals, stone buildings, retaining walls, stone fences or pieces inserted into the layout as random protruding rock with scraps for showing thru grass.

7.) Meaning of Lost-Wax Castings --- This process is the cheapest method of casting small, detailed, hard metal parts in small quantities. A pattern, usually brass, must be made to duplicate some part. This pattern is cast and vulcanized in a rubber mold, the mold cut open and the pattern removed. With the pattern removed and the mold put back together, there is a cavity in the rubber mold like the pattern. Wax is poured into this cavity, which when removed, provides a duplicate in wax of the original pattern. These wax duplicates (waxes) are then cast in investment plaster. When the plaster is set and comparatively dry, it is placed in an oven to burn out the wax (lost wax) and completely dry the plaster, leaving another cavity identical to the oridinal pattern. This plaster mold is then placed in a centrifuge and molten metal poured into it. When cool, the plaster is broken off and the metal castings cleaned, giving you a duplicate of the original pattern. When you recieve a casting that is thin and intricate, and it is bent, generally the cause is in the removal of the wax duplicate from the rubber mold. Since wax is such a fragile material, bending may go unnoticed by the workmen.

8.) Removal of Very Thin, Even Layers of Metal, as is necessary when the dia. of driver treads are slightly reduced or where two surgaces are to fit together quite accurately. First, scribe lines over the surface width with even pressure (even heavy and light pressure will not vary the depth of the scratches more than .001 or .002 of an inch, so this is not too critical). Now file out the scribed marks which serve as an indication of when to quit filing in a certain area, such as one corner or another. This procedure can be repeated several times.

If you are accurately fitting two pieces of metal together(particularly if shiny), such as a cylinder or peg in a hole, or surfaces of irregular contour, paint one surface with dark lacquer or blue dycum and then rub the pieces together. File the spots where the color has rubbed off on the unpainted piece, or file the painted piece where color rubbed off, or both. Repeat the process until desired fit is obtained.

9.) Filling Cracks, Holes and Corners --- The following procedure is applicable when solder never seems to fill a void or is pulled out by nearby solder due to capillary action. A machining "goof" may remove a corner where solder will not hold. Remove as much of the old solder as possible from the crack or hole and fill with very fine copper or brass filings (saved for the purpose) along with flux or soldering paint, preferably piling the filings above the crack. A torch is much preferred for heating as filings will stick to a soldering iron. Use the tip of an ice pick to keep the filings packed down and in the proper location (it is easiest to mix filings with soldering paint). This method of filling is also very useful on very small parts where fitting is difficult or in areas that are too small for shim stock or small slivers. It is advisable to use this procedure as the last soldering step on a piece, as sometimes, particularly on corners, the solder will drain out a bit on the next heating if the filings are not small enough or have not been packed down sufficiently. If silver solder is used, the brass serves to build up an area which silver soldering is difficult to do. Either way, always overbuild with filings to get more compactness and then file smooth later, preferrably after the part has been installed on the engine.

10.) Cutting 1/32" to 3/4" Wide Brass Strips from even .016 thin brass sheet stock without curling, being crooked and with a clean cut is at best a difficult job. Use a small circular saw such as Dremel's or one from a tool supply house (1" to 3" in diameter with about 24 teeth per inch, the smaller diameter preferred) in a lathe with a milling attachment, vertical mill or a drill press with a milling table. Hold the sheet stock vertically in the vise, sticking out as little as possible in order to clear the mandrel nut. The mandrel shank should prodtude from the chuck just enough to let the saw teeth cut through the stock. If the mandrel is heavy enough, wider pieces and much thicker stock can also be cut. Find and correct any vibration which may indicate that something is loose. Cut material slowly and keep hands away from the saw.

11.) Reduce Breakage of Very Small Drills --- a. Be sure the drill continues at the same angle as when started. If it is necessary to drill at an angle, first use a center punch and then drill straight in until the point is well into the metal. Then turn drill angle slowly to the desired angle by applying a little pressure, allowing the flutes to start cutting into the metal. When the flutes are cutting well into the metal, you can then apply normal pressure on the drill. b. If a drill press is used, start the drill slowly so that it stays on the drill axis rather than running off-center. Sharp, straight drill bits help prevent this. c. Use sharp drills. d. Do not run drills at too high a speed as the cutting edge is worn by scraping out the metal rather than cutting it, thus requiring frequent sharpening of bits. 5000-8000 rpm is best for most uses, #60-#80. The foot rheostat for the Dremel Moto-Tool extends the life of your drills and makes for easier drilling too. Regular hand drills are generally too slow and requires a very small secondary chuck, or cut off pin vise. e. Keep bits cool with water, saliva or a lubricant such as beeswax compound (if not too thick to prevent chips from coming out), but better yet, use "Tap Magic" (see their listing) as it not only cools as a thin liquid, but contains chemicals that prevent seizure from weldment of the cutting edge to the metal. Motor oils do cool somewhat but are poor lubricants as they prevent cutting and do not dissipate heat as well as water, a lathe coolant or "Tap Magic" when using larger drills. f. Drill a couple of seconds at a time with light pressure, then withdraw the drill to cool and clear any chips that might wedge and cause breakage. If the drill does break, it might not be stuck so tightly that removal is difficult. g. Wobbly bits are sure to get broken so correct the condition with a better chuck, or if drill bits are slightly bent (a rare occurance), they can be straightened by applying light pressure on side of drill. Some Dremel drill chucks (50¢) are not perfectly true for #60-#80 drills, With chuck in Dremel, straighten same as drills above. h. When re-sharpening drills, be sure the cutting point is ground in the center (best to use a stone), otherwise the bit will drill oversized holes or break.

12.) Removal of Broken Drills and Taps from brass, copper, nickel silver and lead only may be accomplished by the following methods. Put the part in a 15-50% solution of hydrocloric acid in water and allow it to set from 6 hours to overnight in a bottle. Then pull out the stub with tweezers or apply pressure with a pointed object. Do not get solution on your clothes or hand, but if you do, wash immediately. Another method is to dissolve 4 oz. of alum in a Pyrex dish and add water to cover the part. Bring to boil, then cut the heat just enough that the water steams for approximately eight hours. Add water as it evaporates (We have not tried this method, but the previous one is very good). If you do not have the time to wait on the above procedure for removing drills, you can often locate the exact spot on the opposite side of the metal by sighting and scribing lines or by measuring carefully, then drill slowly until you hear the clicking of the drill against the broken bit. Then use an old broken drill, or better yet, use the proper size of piano wire cut rather short so that it will not readily bend. You might have to hold the wire with long-nosed pliers. Then insert into the hole and tap with a hammer until the drill comes out. You may have to try this proceedure several times before success is achieved. It is usually better to drill an undersized hole and use piano wire, to prevent getting an oversized hole from the proceedure.

13.) Variable Elevation Working Block --- This block is used to get small parts, a car or an engine up closer to eye level for much easier work and as an arm rest. Take an ordinary house brick and wrap it with heavy kraft paper from a grocery bag, then tape it on with paper or masking tape. This gives you four different elevations - the table top, and the brick laid flat, on it's side and on end which is right at eye level.

14.) Scale Drawings --- Plans in magazines and books are usually shown in HO scale because the size is readily adoptable. This is no problem to us, however, as you can use an HO scale rule to get the dimensions not shown, then use an S scale rule to lay the plan out, or use our multiple rule #616.1. The same proceedure is applicable for O scale drawings.

15.) Layout Plan --- Cut switches, curved and straight roadbed to full size from cardboard. Lay these on the floor in the area of your layout. When satisfied that this is the way that you want the layout, draw around them with chalk or colored pencil. Do not worry about marring the floor, as the lines will have to be redrawn several times and will finally be worn away while wiring the layout. Build the grid and then re-lay your cardboard layout on the floor again for proper fitting of all parts. Remove from the floor and lightly tack it in place on the grid, to be replaced gradually as roadbed base is installed.

16.) Ballast --- If you want to make your own ballast it is a fairly simple matter to crush stone (preferably limestone) or a brown river rock if this color is satisfactory. It is a fair amount of work using a hammer and a frame with regular house screen tacked over the bottom. A cigar box with the bottom removed can also be used. For smaller sized ballast, the screen can be pulled at diagonal corners so that the holes in the screen are diamond-shaped rather than square, making smaller holes. Varying amounts of pulling will make varying sized holes in the screen. Tack the screen to the frame when the desired shape is reached, and cut off the surplus around the frame. Coffee grounds can also be mixed in with the white stone in small quantitites, or in greater proportion with the brown stone to reduce the amount of crushed stone necessary. Varying sizes of ballast should be used but bulk of material should be larger pieces.

17.) Trays for small parts drawers can be made from those very light cookie and candy plastic trays. Add a thick coat of plaster of paris on the back to stiffen them. Since milk cartons are now plastic coated, they too make excellent drawer compartments, and are white on the inside with the drawer sides hiding the lettering on them. "Instamatic" flash cubes can be used (obtained from friends) by inserting a small screwdriver in a hole in the bottom to pry out the inside assembly, or cut around the cube between the clear plastic and black base with a knife to release the mechanism. If the cube is too tall for your use and is is hard to get your fingers in to remove parts, hold the cube against a grinding wheel and grind down to a more desirable height. A dozen or so of these can be put in an appropriate sized box to hold them together, using glue or Pliobond if desired, or imbed in a thin layer of plaster of paris in the bottom of the box.

18.) Epoxy Solvent --- A drop of Methyl-Ethyl-Ketone (MEK), available in small quantities from chemical supply houses, will soften epoxy in about 30 seconds. MEK is harmful to the skin and fumes are considered dangerous. Use in a well ventilated area. Large solid parts such as Sand Domes may be removed by a sharp, sideways blow with a plastic, copper, wood or lead hammer, or bar. mr

19.) Car and Building Window Screens --- Fabric silk screen, such as that used in a silk screen process, can be used. Look in the Yellow Pages of the phone book under "Silk Screen Printing". They may give some old or used ones. mr

20.) Curtains and Draperies for passenger cars and houses can be made from crepe paper. If the proper color is not available, use white and stain it, possibly with coffee for buff and brown. Or use water colors for coloring. mr

21.) Southern Ry. Ps-4 Green Paint --- Use Pactra F5 Anti-glare green. Paint Firebox, Smokebox and Smoke Box Front aluminum, with a little black added to it. mr

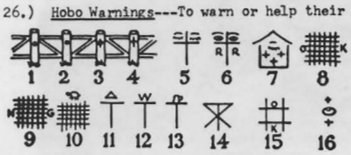
22.) Mix Paint Quickly in small bottles. Drop in a chemically stable object such as a brass screw, glass beads, small broken glass(without slivers on it)etc. and shake well. mr

23.) Flat Paint Colors from Glossy enamels, lacquers or paint is obtained by mixing in a talcum powder (wife's face powder or your after shave powder) of about 1/6th the volume of the paint. Even plaster of paris powder used in layout paint has no apparent bad effects after seven years.

24.) Small Weeds on Sidings, for more realism and around yards, can be cut from lichen in lengths of 1/16 to 1/8 of an inch and stuck between the rails with varnish. mr

25.) Small Brushes---Use a small 10¢ Paste brush from the dime store for cleaning metal filings from small parts that are being worked on, cleaning sandpaper dust from cars, brushing old grease from worms and gears (along with gasoline or thinner), brushin on ageing powders and other small work requireing a small, stiff brush. Use a cheap paint brush about 2" wide (from a hardware store) for brushing dust from the tops of cars, engines and structures. For cleaning chips from a lathe, mill, drill press or saw, use hemp brush of the same shape as regular paint brush, or old or cheap paint brush

26.) Hobo Warnings---To warn or help their fellow 'boes that may follow them, hoboes scroll signs on fences or buildings and some applicable ones in freight yards. Any 'boes been around your layout - better look and see. If not, you will want to add some personal touches to your buildings and fences. Common symbols used by hoboes: 1 good for a handout, 2 cranky woman or bad dog, 3 not generous, 4 stay away, 5 police not hostile, 6 police hostile; R R-used for railroad police, 7 jail good for a night's lodging, 8 clean jail, 9 jail food no good, 10 unclean jail, 11 jail has a rock pile, 12 jail is a workhouse, 13 saloons in town, 14 town is hostile, 15 streets good for begging, 16 plain-clothes detectives here.



"By permission. From Webster's Third New International Dictionary, Copyright 1966 by G. & C. Merriam Company, Publishers of the Merriam-Webster Dictionaries."

27.) S Scale Buildings can easily be made from O scale buildings since few if any industrial buildings have any set dimensions; even houses and window sizes vary greatly. A few changes will be necessary. The bottom of the building can be removed between the ground and the windows to a more accurate S dimension, necessitating new thresholds for the doors. Also remove a bit of the material between the roof and the top of the windows. This would not apply to O scale buildings, such as switch towers, stations, etc.

28.) Pulse Power --- The best and easiest source we know of is to simply put a 6 volt, 10 amp transformer winding (secondary winding) in series with either of the D.C. leads of your D.C. power pack. Of course, the primary A.C. leads to the 110 volts. The 6 volt secondary must be about 10 amps or more to pass the current your engines will draw from the D.C. power pack thru this transformer's windings without it heating up and burning out. The secondary could be two-3 volt windings in series of 10 amps each, or two-12 volt windings of 5 amps each in parallel. They have to be wired in proper phase, so check the results with a voltmeter before final installation--or TV man check it.

29.) Mailing --- When wrapping packages for mailing, do not pack for the old-fashioned 6 foot drop test, but instead, for the more modern post office method of handling each of your packages---the throw across the room test. Sometimes our packages are on the bottom of the bag and hit the floor when thrown from loading dock into trucks. Packaging to counter such rough treatment is sometimes difficult to impossible, but is the only safe counter-measure.

30.) Mixing Cups --- Occasionally we have need for a small container in which to mix a few drops of paint or epoxy. Take the lid from a small paint jar, ketchup bottle, etc. and bend the top concavely with a ball pean hammer. Make the surface smooth so that it may be easily cleaned for future use.

31.) Tender Coal --- Very realistic and easily removeable coal can be made by cutting a piece of sponge rubber slightly larger than the tender bunker and sloped downward at the front where the coal has been used. Cover the top of this with your coal material, (*) preferably cemented down with a rubberoid cement, such as "Pliobond" or "3M Scotch Contact Cement". The coal assembly can be tightly squeezed into the tender or easily removed for repairs and access to bolster screws. Hoppers or gondolas could be similarly prepared with various sizes of coal or stone. * We have seen a very realistic coal by Life-Like Products Inc., Baltimore, Md., At 35¢ a package. Check with your local hobby shop.

32.) Piping --- If you can use copper piping, ask your TV repairman for a burned out power transformer with low voltage windings. It will furnish several sizes of piping.

33.) Scale Speed is figured by a. mph equals feet travelled in 44 seconds, or b. mph equals inches travelled in 3½ seconds. A rough rule of thumb for engine speeds since about 1910 (for various driver sizes) is 1¼ mph for each inch of driver diameter. Freight engines are probably closer to 1 mph for each inch of driver diameter. Of course, this will vary from engine to engine, and with improved designs. Therefore if the proper gear-worm ratio is found for one motor and driver diameter, the same gear-worm-motor is correct for all diameter of drivers.

34.) Left-Over Glue or mixed epoxy can be used to fill some of those cracks or holes in your work bench, to make it a bit smoother again, rather than throw away epoxy or glue.

35.) Cut-Off Discs--We cannot too strongly recommend the use of cut-off discs in your Moto-Tool to save many extra hours of rough filing, cut off gatings, rough cutting, and cut small pieces or rods in half. Disc edge cuts fast. Then use side of disc or file to smooth down. Even more useful if binocular magnifiers are used. (Always wear glasses, as discs break rather easily, until you learn to hold them very strait.)

36.) Accomplishment --- If you have a very large or difficult undertaking to be done, break it down into a number of small, simpler tasks. Knocking these off one at a time as singular objectives in a game-like way (if possible) greatly reduces the strain and pain of a seemingly monumental task.

NOTHING TRIED IS NOTHING ACCOMPLISHED. LEARNING IS RECIEVED ONLY BY TRYING SOMETHING

Continued from page 15

BALDWIN LOCOMOTIVE PICTURES

Steam, diesel, electric and electric mine engines listed in a 100 page, 8½x11 catalog, according to engine number of 8000 pictures (from original Baldwin negatives) that are available at $5.00 for the catalog for your many references. 4x7 pictures, 25¢; 8x10, 50¢; all glossy, which is a very reasonable price. Minimum order $1.00 plus 50¢ postage and handling. Now if you see a picture of a Baldwin-built engine that you want to build, you can see it listed in the catalog, or write Mr. Broadbelt (a former Baldwin employee) for a larger picture, other side and front. He has engine pictures of every road in this country, also foreign. Order from: H. L. Broadbelt, 310 Glenside Ave., Morrisville, Pa. 19067.

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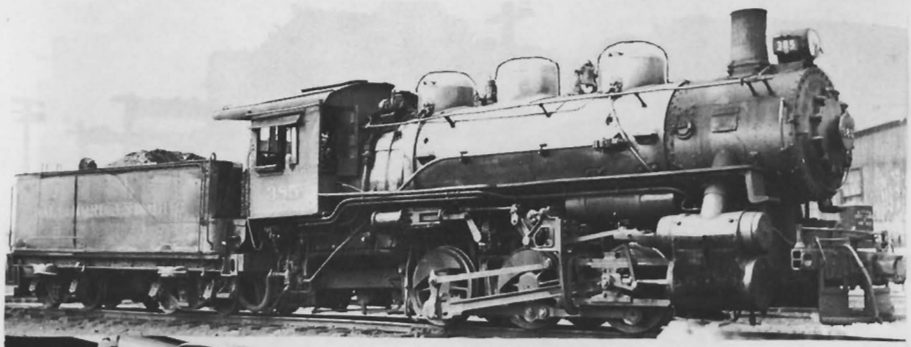
LIMA LOCOMOTIVE PHOTOS AND PLANS

Photographs - Approximately 350 available, from 1885-1949, of various types, wheel arrangements, railroads or companies. Price of reference listing, $1.50. Also a listing available for "Shay" geared locomotives. Very sharp photographs available in 8x10 size in all cases, and Builder's Photographs 3¼x9 with specifications on back in many cases, but not all. After approximate date of 1906, listings will show these for which Builder's Photos are available, at $1.00 per print, or 8x10 glossy at $1.50 per print. If not interested in a listing, write regarding your particular needs or preferences.

Plans (Drawings) - 1½" = 12" scale drawings available for some 35-40 steam locomotive (engine portion) designs, types or different railroads and/or wheel arrangements. Side elevation views, cross-sectional views, and some detail drawings in a very few cases. Reference listing available at 25¢. Prints average 7-12 feet long, depending on locomotive type. Price on application, averaging $4.50-$8.50 per print. Write to: P. E. Percy, 313 Singleton Ave., Lima, Ohio 45805.
Pictures - 8KEberkD Plans - Ebr

Engines for Parts - Photos - Plans Codes



Caption — Code

USRA 0-6-0 Switcher (B&O #385) — 6

Alco, Baldwin

Courtesy of H.K. Vollrath

USRA 0-8-0 Switcher (B&M H2a, #620)

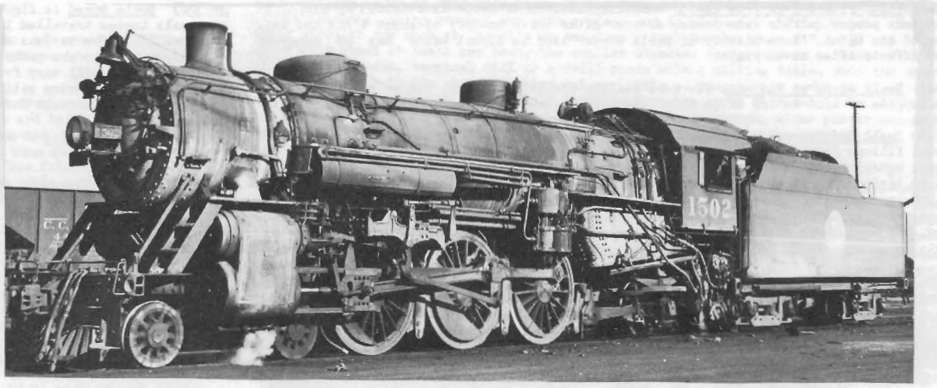
Alco, Baldwin, Lima

Courtesy of H.K. Vollrath

USRA Light Pacific (ACL P-5a, #1502) p

Alco

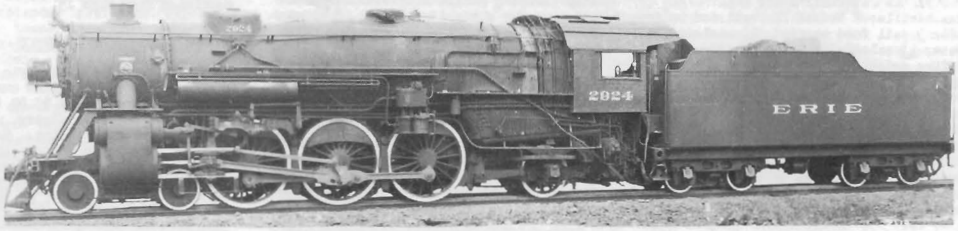
Courtesy of H.K. Vollrath



USRA Heavy Pacific (Erie K-5, #2924) a

Alco, Baldwin

Courtesy of H.L. Broadbelt



Southern Ps4 Heavy Pacific (#1393-1407) c

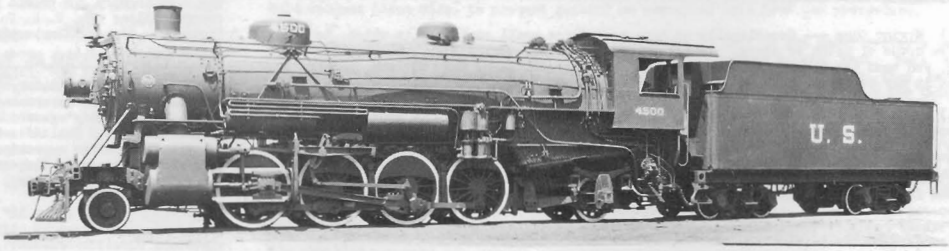
Alco, Baldwin

Courtesy of H.L. Broadbelt

USRA Light Mike M

Alco, Baldwin, Lima

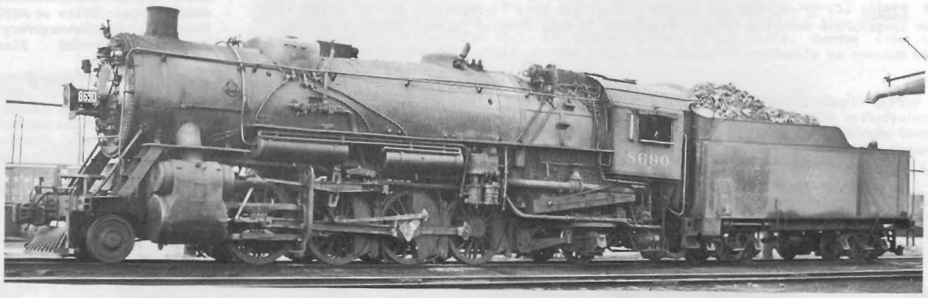
Courtesy of H.L. Broadbelt



USRA Heavy Mike (Mil. L-3, #8690) I

Alco

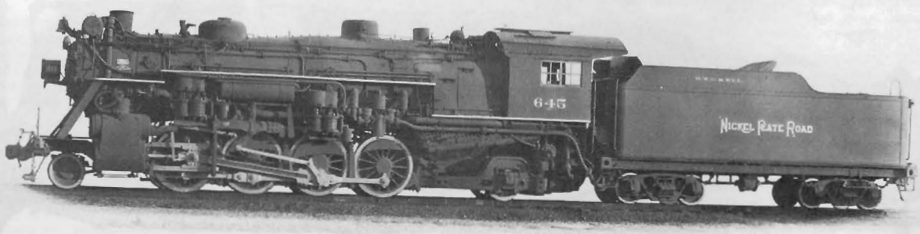
Courtesy of H.K. Volrath



NKP Light Mike H-6-E (#632-661) K

Lima

Courtesy of P.E. Percy



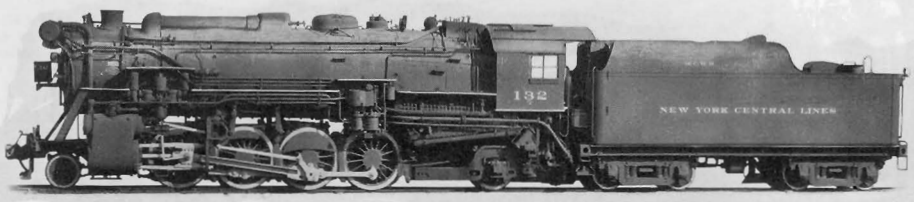
NYC and Mich. Central Heavy Mike H10a E

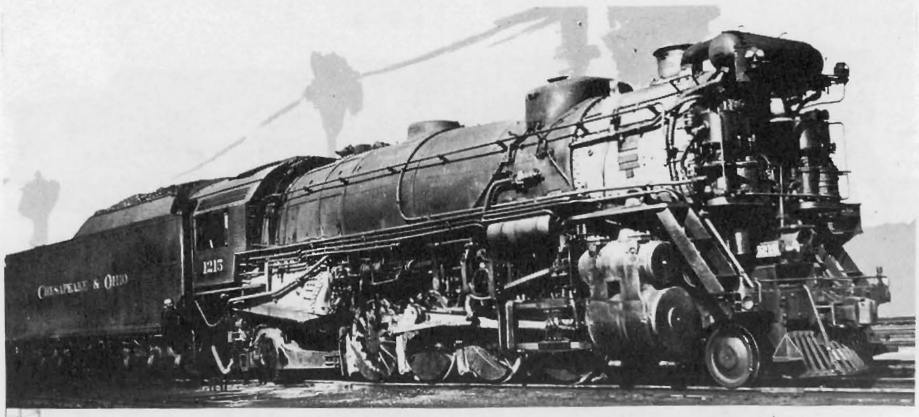
NYC #1-65 renumbered #2101-2165, Lima

NYC #2166-2222, Alco

MC #123-132 renumbered #2223-2232, Lima

Courtesy of P.E. Percy

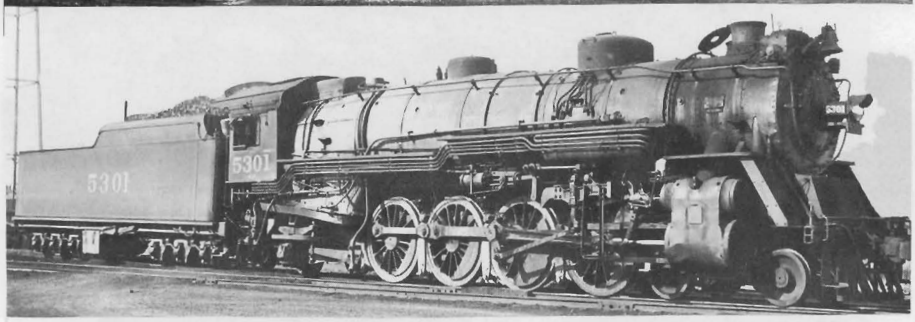




C&O Heavy Mike K-3 (#1210-1259) S

Alco

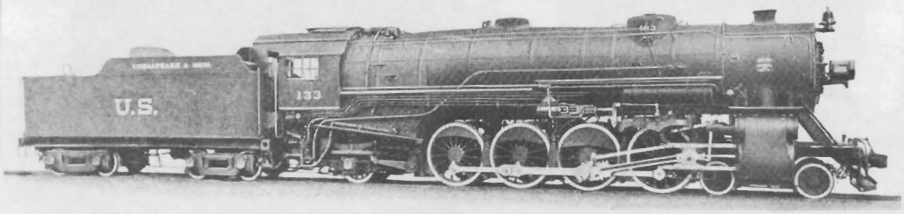
Courtesy of H.K. Vollrath



USRA Light Mountain m

Alco, Baldwin

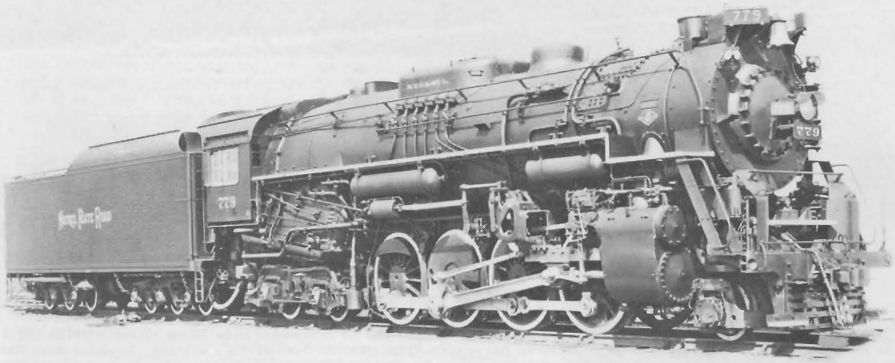
Courtesy of H.K. Vollrath



USRA Heavy Mountain o

Alco, Baldwin

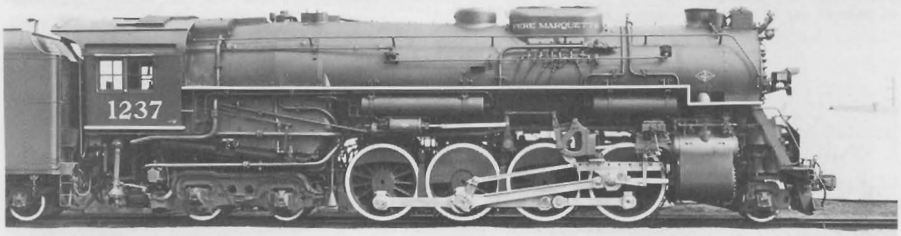
Courtesy of J. Stefan



NKP Berkshire S-3 (#770-779) b

Lima

Courtesy of P.E. Percy



Pere Marquette Berkshire N-2 (#2135-2139) e

Lima

Courtesy of P.E. Percy

C&O Berkshire K-4 (Kanawha #2750-2759) r

Alco, Lima

Courtesy of P.E. Percy

B&A (NYC) Berkshire A1-a (1400-1424) k

Lima

Courtesy of P.E. Percy

C&O Hudson L-2 (#300-307) H

Baldwin

Courtesy of H.K. Vollrath

NYC Hudson J-3a (#5405-5434) U

(25 engines built with Scullin Disc drivers, 25 Box-Pok)
(Earlier engines used spoke, all were 79")

Alco

Courtesy of H.K. Vollrath

NYC "Mohawk" L-3b (#3035-3049) D

Alco, Lima

Courtesy of P.E. Percy

Useable in other gauges, particularly On3 *

CUSTOM CAR & ENGINE BUILDING--Here is a well known professional custom builder who is interested in building either scratch built engines along with what ever parts we have, or he will build up our engine kits. At the time of this writing he has seen our Berkshires but has not built one. He estimates the total cost RTR (ready to run) at $200. Painting extra if so desired. For those of you who are too busy to build the engine, this is the nationally know custom builder you have been waiting for to get a first class engine on your road. Write today to Arvid L. Anderson, Box 392, Frederic, Wisc. 54837. Give him full engine details wanted, from bottom of page of our kits, marked Important.

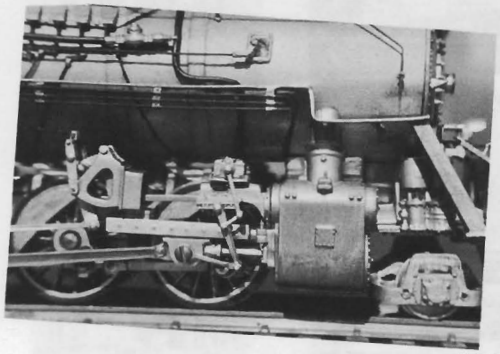
Let's Take A Close Look

(We are Prejudiced)

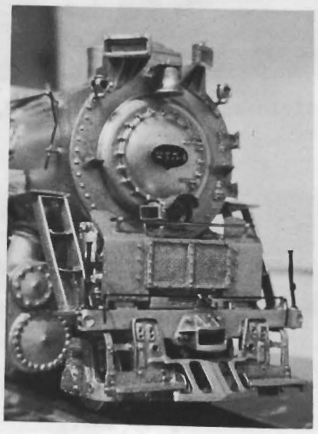
The versatility and multiple use which your castings are adaptable would require many pages to list. Just a few, which I am or will be building from your present parts are (with a few alternations, mostly Boilers); Soo Line Northern 4-8-4, Akron Canton & Youngstown Mikado, NP 2-8-8-4 class Z-5 "Yellowstone", and have converted AF Hudson to scale J-1a. I feel that those of us who wish to model steam can, with a little effert, build a very representative stable of locos. Your Pullman passenger trucks work beautifully under my AF and Miller cars. They are all that you claim. J.A. Kromhout, 2244 W. Hwy. 36, St. Paul, Minn. 55113

I think the S gauge Berks are tops in every way. Liked #1 so well that I'm building #2. Assembly not too tough, Pulling power and speed is good. Good looking too. Fred Kurtzbein, Box 309, Montevideo, Minn. 56265

For me the 3 Berkshires are the soul of S gauge, the main reason I am in S gauge today, instead of remaining in O. When I got my first kit, C&O, and saw all those parts, I said to myself, "I'll never get this together." But once started, found it was not so hard after all, just time, patience and concentration. I believe the Berkshires are worth every penny of it. In fact my C&O is not quite done, and already have sent for the NKP. As soon as the USRA's are ready, you can bet your boots I'll have all four of them. Robert Parri, 1171 Rosedale Dr., Greensbury, Pa. 15601

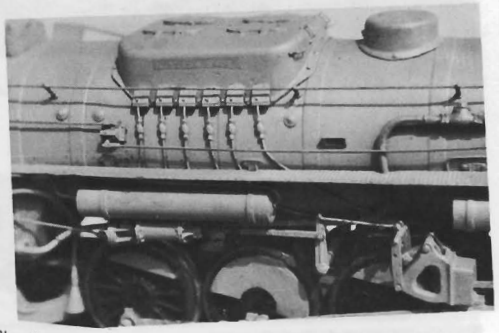


The detail of the parts are exquisite---the finished loco is a true marvel of realism,----operates at a truly realistic speed at low current setting. It has pulled every car I own----all at once----Passenger and freight. It is not a building project for the rank beginner to modelling, but anyone who has been some modeler for a while and has the basic hand tools, can build this engine by carefully following the instructions. I did, and it was my first attempt at engine building. I did some assemblies with a soldering gun, then did all heavy assembling with epoxy. After more than 2 years there has been no failure of any epoxy bonds. Will Estes, 3604 S. 41st Terr., St. Joseph, Mo. 64503

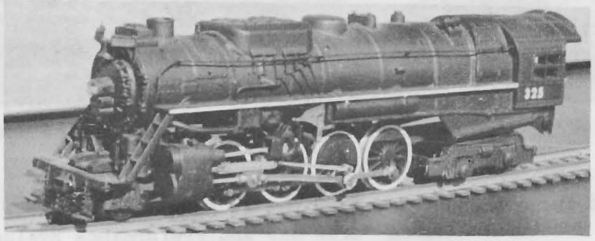


I wished you were making patterns in HO.

Anonymous



The Berkshire castings, I think, are the finest in any gauge. I've used Kemtron and Cal-Scale, and the Berkshire castings are second to none. The Berkshire itself isn't exactly a fall together or over night project. It requires planning, a knowledge of soldering, and a lot of time---any one can build one. I had to learn to solder, since before attempting the Berkshire I had only soldered wires together. The soldering tips frunished are excellent. That, along with a little practise, is how I learned. I'm building two Berkshires and while they are not completed, both are running. They are a fine looking, quiet and powerful running models. I would be glad to answer any questions concerning the engine or anything about S gauge.
Bob Willson, 603 E. Taylor St., Kokomo, 46901 Indiana



A Very Small Example How AF Can Be Upgraded Or Changed
(Very Little Work For Some)

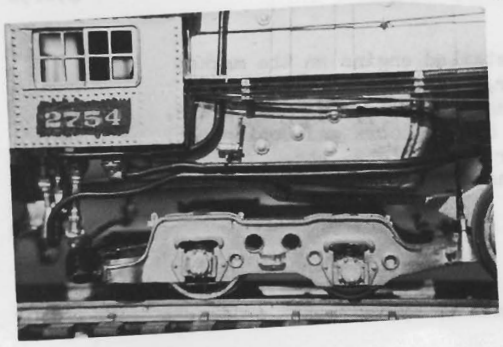
The Berkshire, with its excellent castings, was my prime reason for going into S gauge. Of 35 engines I own, it is the best and smoothest running. The 60 tread angle is a great boon compared with 30 or flat treads, as they do not pick at switch points. They ride much more centered on rails, especially when coupling in rough yard track. Joe Scales III, 460 Plattsville Rd., Trumbull, Conn. 06611

You are to be congradulated on such a beautifully designed and detailed model. S gaugers should be very thankful and appreciative for your untiring efferts to give our gauge this "beauty of a locomotive." I would certainly recommend it to all who want a superbly detailed, smooth operating locomotive. There is a minimum of casting trimming, and I enjoyed every hour spent on it. Dr. W.A. Doe, 8582 Cartier St., Vancouver 14, B.C., Canada.

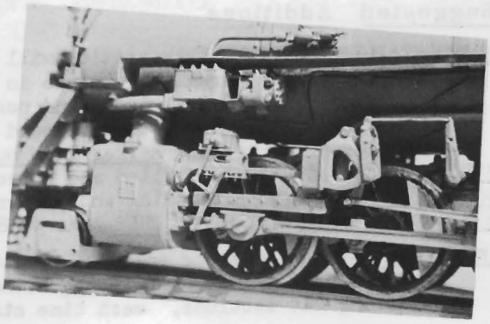
Having never scratch built a loco, or attempted to assemble what I considered a craftsman type loco kit. The Berkshire gave me misgivings at first, but after trying my hand at soldering the main castings to the heavy boiler casting, using a Bernz-O-Matic propane torch, and finding how simple it could be with patience and care. I enjoyed the challenge it presented. The castings are beautiful, and completed appearance is exceptionally rewarding. My loco has won a 3rd place in a national NMRA "Draw Bar & Performance Evaluation" contest, yet it has only four flanged drivers and no extra weight added.
Frank Titman, Editor of S Gauge Herald

(The above engine is pictured and reviewed in "Trade Topics" of "Model Railroader," 12-66, p-10. Other pictures of the Berkshires have been in several issues of the "S Gauge Herald" and "Railroad Model Craftsman's" "Boomer Trail," 3-67, p-30.)

There are no short cuts on detail. If there is a rivet on the prototype, there is a rivet on the model,---it is all there. The superdetail compares with the finest in any gauge. I did not find the loco too difficult to build, tho not an overnight kit. The end product is highly rewarding and satisfying. I find the performance and torque terrific, from slow crawl to a scale 90mph, whether with one or 15 cars. The smoothest running engine I have ever seen, quiet as a whisper. In fact it does not run at all, ----it glides over the rails. The 6 wheel passenger trucks and wheels are excellent in performance, clicking at every rail joint, hugging the rails and picking up speed down a 4% grade. In my openion, these trucks with wheel sets are one of the most reasonable priced items in the catalog. The quality built into these sprung trucks is unsurpassed in any gauge. Jess Bennet, Star Rt., Sandpoint, Ida. 83864



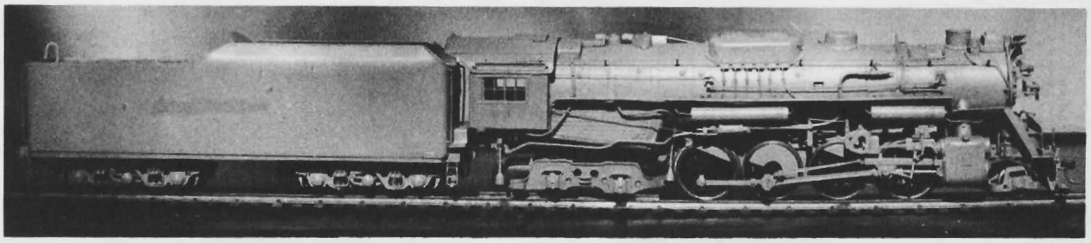
I liked the assembly of the Berkshire immensely. Construction is well within the capabilities of anyone with some experience of kit building, particularly if he has had any attempts at scratch building. My personal preference was tapping and screwing many parts on, where soldering was advocated. Dr. Stephan Suggit, "Chelmsfort," 33 Wickham Terr., Brisbane, Qld., Australia.



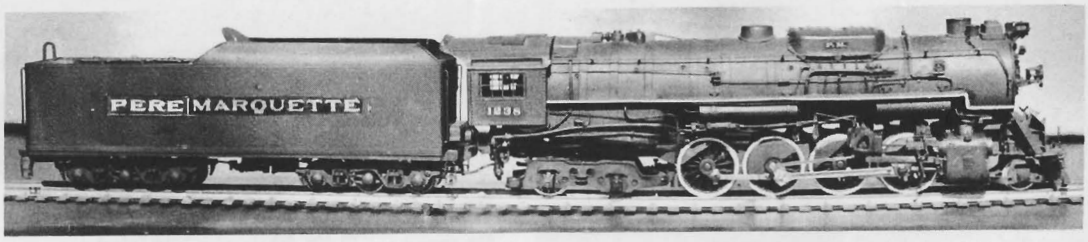
3 FAMOUS BERKSHIRE KITS

These are the "overgrown" Mikes that the diesels almost did not beat

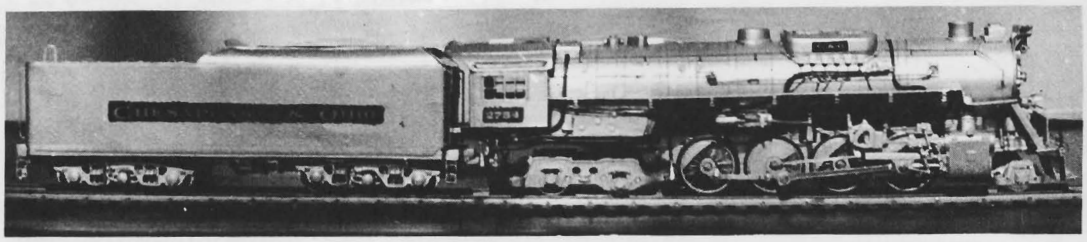
All parts "superdetailed" lost-wax castings

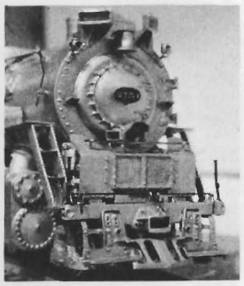


Nickel Plate S-3, #770-779. Last steam engine made, May 13, 1949, from Lima.



Pere Marquette N-2, #1228-1239. (PM a subsidiary of C&O.)





Chesapeake & Ohio K-4, #2750-2759(Kanawha). Next to last steam engine made.

Those who have built these engines say they run as slow and smooth as any engine they have seen. To back this up, they have won the following "Draw Bar and Preformance Evaluation" contests at National NMRA conventions; 2nd place with all gauges in 1963, 1st place for S in 1964, and a 3rd place in 1966. All parts are of the highest quality and detailed lost-wax castings as are available any where.

KIT AVAILABLE IN WHOLE OR SECTIONS

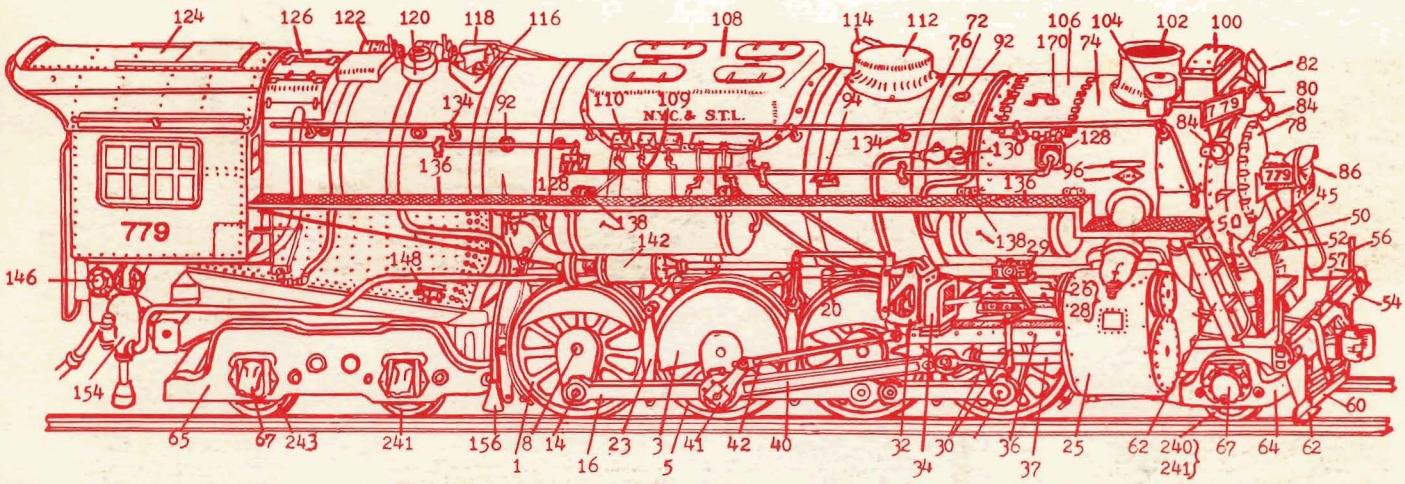
BASIC RUNNING GEAR----Drivers, counterbalances, worm, side rods, frame, crank pins and steam chest.	$25.70
RUNNING GEAR DETAILS-Crossheads and guides, valve gear, all rods, air pumps, shields, beam, deck, coupler pocket, pilot and steps, front steps, pilot truck, trailing truck, and wheels.	25.20
BOILER AND BOILER PARTS--Boiler, boiler front, bell, head light, numberboards, marker lamps,feedwater heater, stack, Miller Muffler, superheater door, sand and steam domes, sanders and blocks,whistle, pop valve, lower water alarm, muffler, generator, cab, turret, check valves, handrail posts, boards, tanks, hotwater pump, power reverse, injector, piping, valves, etc.	30.50
TENDER-Stamped one piece prebent wrapper of prototypical size rivets, cast brass frame, draw bar,hatches, light, die stamped riveted deck, strap steps, ladder, bunker ladder, Buckeye trucks and wheels .	17.50
	$98.90

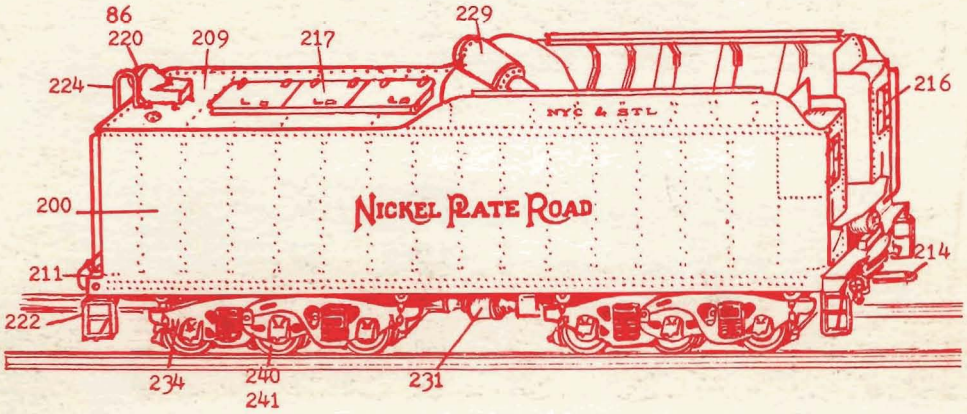
Suggested Additions

SUPERDETAILING SECTION--This section will make your engine the most highly detailed engine on the market in any gauge, a real "Prototype in Minature". Leaf springs, lubricator, compressor filters and governor, shield grab irons and posts, uncoupler brackets, bands, engine plates, washout plugs, throttle rod levers, cocks, cold water pump, valves, grab irons, bunker doors and tool chest, tender brake system, marker lamp bulbs, flagstaffs, boiler and boiler front steps, etc.	17.70
MOTOR, DC-86-- $7.25, or drilled and tapped for our frames and #10.1b worm installed. for above engines.	8.75
SOLDERING PAINT--(#655.1) Flux and solder in thick liquid, see #655.1.	.75
63" S SCALE STAINLESS STEEL RULE--See #658.1	1.10

Important --When ordering engines, state whether scale or hi-rail flanges. For scale, should center drivers be flanged? (Hi-rail are blind.) Unless otherwise ordered, truck wheels will be brass. When ordering kit sections, each time state for which engine, we cannot remember your past orders.

Visual Index





Many catalog parts cannot be indexed, above, as they are from different type engines. But you can find a simular part.

Recap of Engine -- Parts -- Photos -- Plans Codes

Parts Code	Engine The Part Goes On
6	USRA 0-6-0 Switcher
8	USRA 0-8-0 Switcher
p	USRA Light Pacific
a	USRA Heavy Pacific
c	Southern PS-4
M	USRA Light Mike
I	USRA Heavy Mike
K	N.K.P Light Mike #632-661
E	N.Y.C Heavy Mike H10-a
S	C&O Heavy Mike #1210-1259
m	USRA Light Mountain
o	USRA Heavy Mountain
b	NKP Berkshire #770-779
e	PM Berkshire #2135-2139
r	C&O Berkshire #2750-2759
k	B&A Berkshire #1400-1424, A1-a
H	C&O Hudson #300-307
U	NYC Hudson #5405-5434
D	NYC Mohawk. #3035-3049, L-3b
*	Useable in other gauges.

Prototype Measure	S Measure	Nearest Fraction	Nearest # Drill
1/16"	.001	-----	-----
1/8"	.002	-----	-----
1/4"	.004	-----	-----
3/4"	.012	-----	#80
1"	.016	1/64"	#78
1 1/4"	.020	-----	#73
1 3/4"	.028	9/32"	#70
2"	.032	1/32	#67
2 1/2	.040	-----	#60
2 3/4	.044	-----	#57
3	.047	3/64	#56
3 1/2	.055	-----	#54
3 3/4	.059	-----	#53
4	.063	1/16	#52
4 1/2	.071	-----	#50
4 3/4	.075	-----	#48
5	.078	5/64	#47
5 1/2	.087	-----	#44
6	.094	3/32	#42
6 1/2	.102	-----	#38
7	.109	7/64	---
7 1/2	.118	-----	#32
8	.125	1/8	---
9	.142	9/64	#28
10	.156	5/32	#22
11	.172	11/64	#11
12 (1')	.1875	3/16	#12
1 1/2'	.281	9/32	K
2'	.375	3/8	V
2 1/2'	.469	15/32	
3'	.562	9/16	
3 1/2'	.656	21/32	
4'	.750	3/4	
5'	.937	15/16	
6'	1.125	1 1/8	
7'	1.312	1 5/16	
8'	1.500	1 1/2	
9'	1.687	1 11/16	
10'	1.875	1 7/8	
11'	2.062	2 1/16	
12	2.250	2 1/4	
13	2.437	2 7/16	
14	2.625	2 5/8	
15	2.811	2 13/16	
20	3.750	3 --	
25	4.687	4 11/16	
30	5.625	5 5/8	
35	6.562	6 9/16	
40	7.500	7 1/2	
45	8.437	8 7/16	
50	9.375	9 3/8	
60	11.250	11 1/4	
70	13.125	13 1/8	
75	14.062	14 1/16	
80	15.000	15 ---	
90	16.875	16 7/8	
100	18.750	18 3/4	

Wheel Diameter	S Scale Diameter	Used On	Usual Spoke #
28"	.438	Pilot Truck	
30"	.469		
33"	.516	Freight Cars, Pilot Trucks	
34"	.532		
36"	.562	Pass. Cars, Diesel, Pilot Tr.	
37"	.578		
39"	.594		
40"	.625	Diesel	
43	.672	Trail. Trucks	
45	.704	" "	
48	.750	" "	
51	.797	" & Steam Eng.	
53	.829	" " "	
56	.875	A.F. " "	13
57	.890	" "	
58	.906	A.F. " "	
61	.953	" "	
63	.984	" "	15
65	1.015	" "	
67	1.047	" "	
68	1.062	" "	15
69	1.078	" "	15
70	1.094	" "	
71	1.110	" "	
72	1.125	" "	17
73	1.141	" "	
74	1.157	" "	
75	1.172	A.F. " "	
78	1.219	" "	17-19
79	1.234	" Should Be " "	" "
80	1.250	" "	" "
84	1.312	" "	" "

Engine Piping

Prototype I.D. Size	S Scale O.D. Size	B&S Wire Size
1/2"	.010	#30
1"	.020	#24
2"	.036	#19
3"	.055	#15
4"	.070	#13
5"	.086-.091	#11-#12
6"	.106	#10 Approx.

Note: When ordering brass wire from local suppliers, order by size rather than gauge, as sometimes brass wire varies in gauge and corresponding size.

Screw Thread	Tap Drill	Clearance Drill
00-90	#60	#55
0-80	#56	3/64
2-56	#50	#42
4-40	#43	#31
6-32	#36	#27
8-32	#29	#18

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57	.890	" "	
58	.906	A.F. " "	
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