See 1½" scale parts beginning on page 39.

LITTLE ENGINES

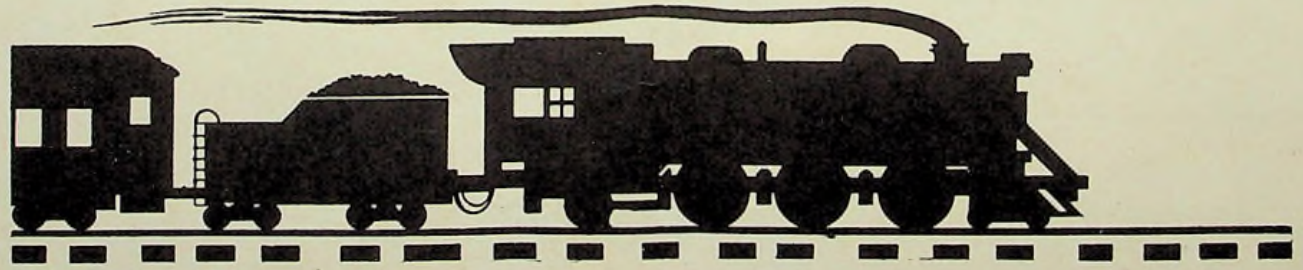
1950

CATALOG

LIVE-STEAM LOCOMOTIVES

CASTINGS, PRINTS, METALS TOOLS, RAIL AND RAIL FASTENINGS.

GENERAL SUPPLIES FOR MODEL ENGINE BUILDERS.



ADDRESS ALL CORRESPONDENCE TO P.O BOX O LOMITA CALIFORNIA

LITTLE ENGINES

HOME & SHOP
2135-37 250TH ST.

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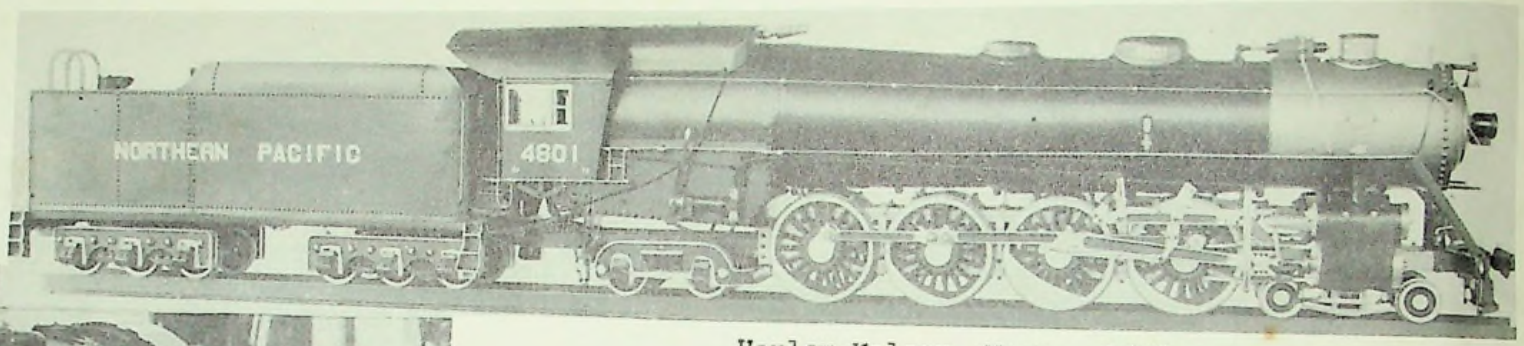
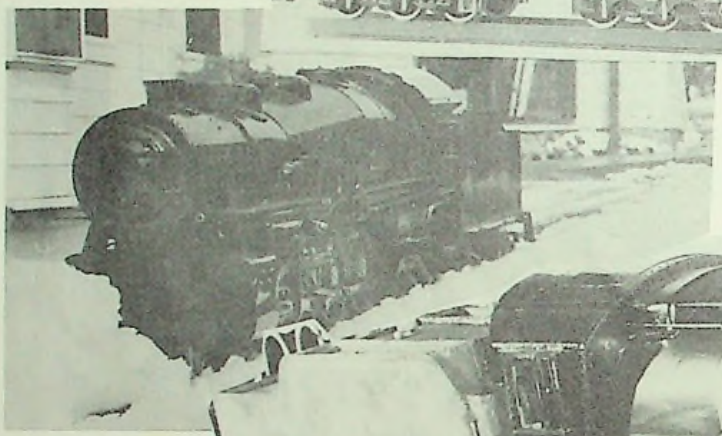
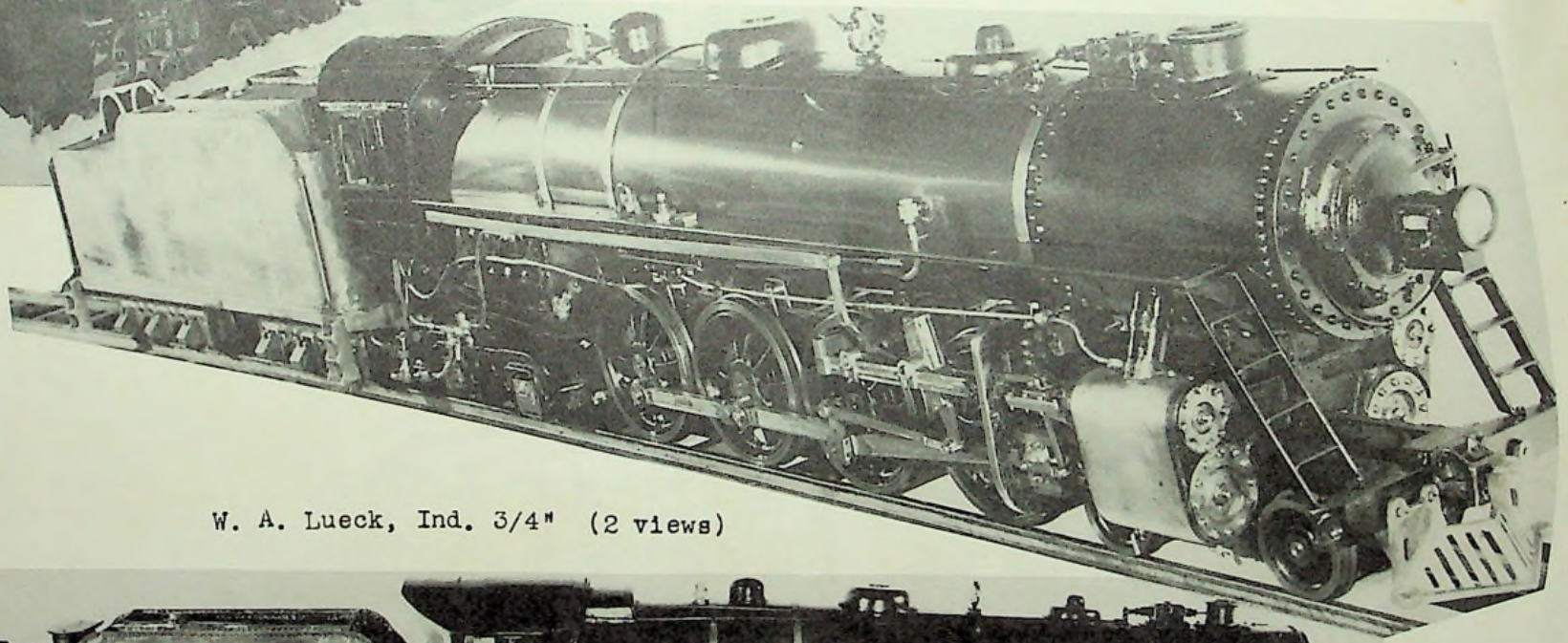
LOMITA CALIF.

Gordon W. Corwin using his 3/4" for a snow plow in California.

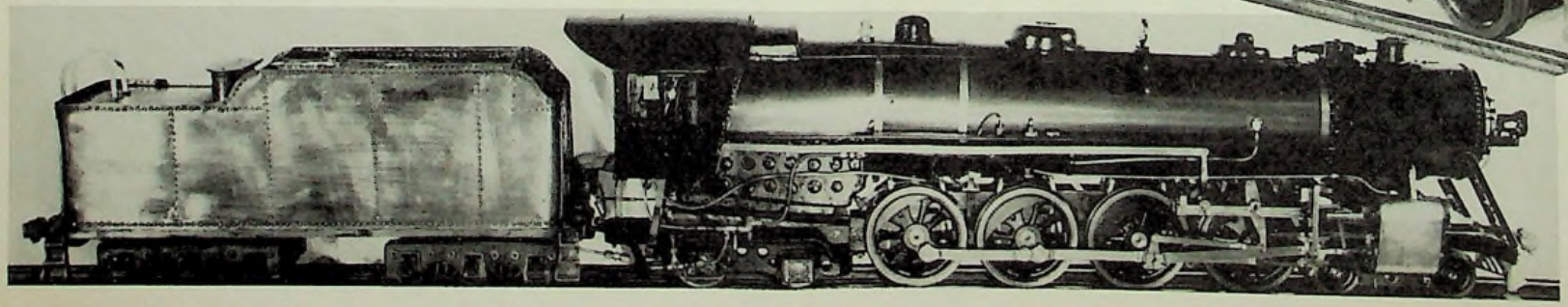


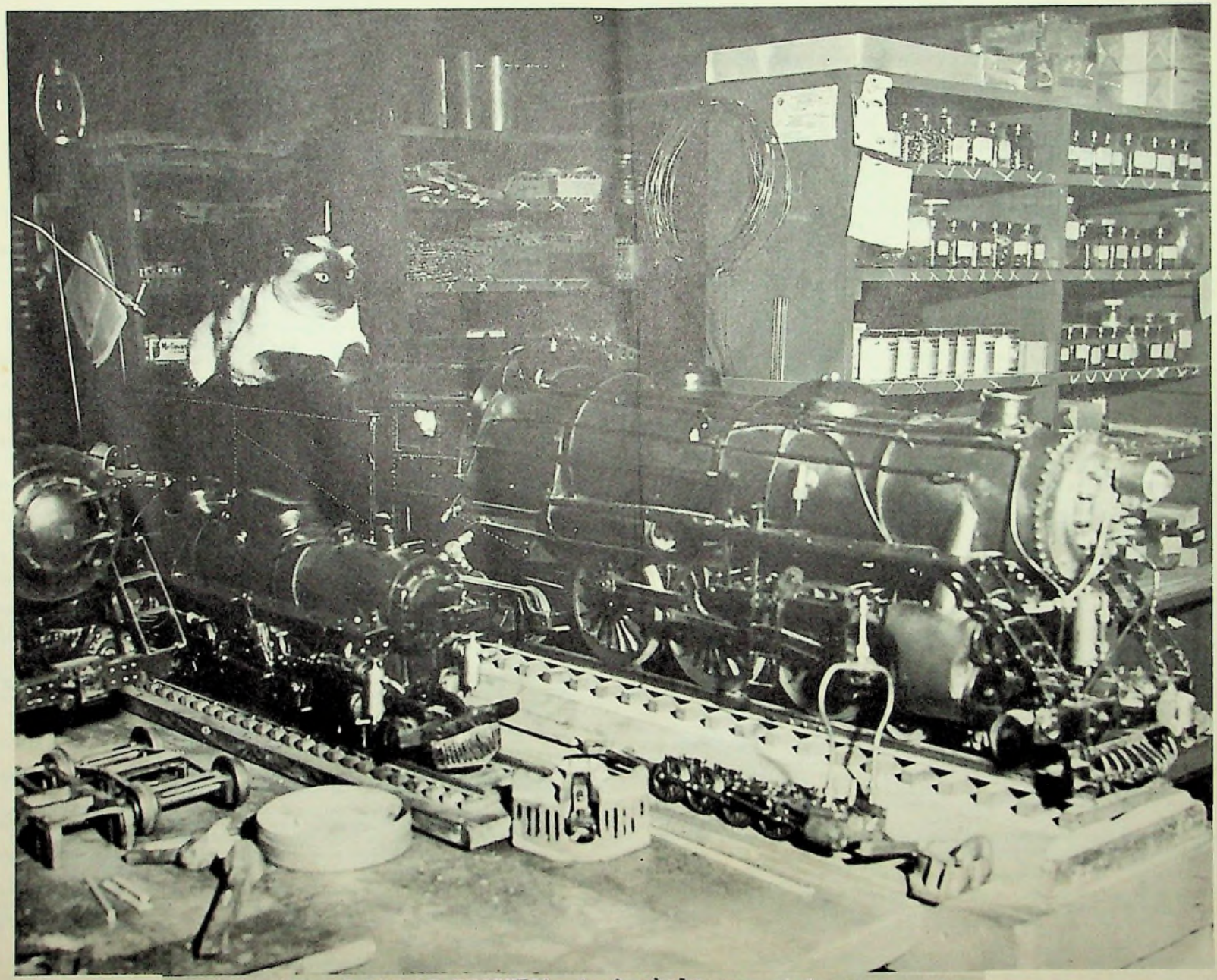
Harley Halsey, Wash. 3/4"





W. A. Lueck, Ind. 3/4" (2 views)





Partial view of LITTLE ENGINES' stock shelves, and "guinea pig" locomotives. Minsk, the Siamese cat, is playing conductor riding the tank.

SPELTER SOLDER

PRACTICE IN MIXNG SPELTER SOLDER FOR USE ON BRASS AND STEEL TUBES

TO PREPARE BORAX

Put sufficient quantity of Borax in pan to cover bottom of pan, heat over slow e—an hour should be sufficient to dry out the borax. Borax should crumble the fingers to fine powder.

TO PREPARE SOLDER

The Solder is mixed with Burnt Borax in the proportion of 10 pounds Solder to pond of Borax. Add enough water while pounding for 1½ to 2 hours to bring to cing to the consistency of putty. This mixture will serve as the supply.

TO USE

Place a small quantity in a brazer's dish, thinning with water to about the consistency of cement for grouting. Apply this mixture to the articles. This formula can be changed to meet conditions.

PRACTICE IN MIXING SPELTER SOLDER ALLOYS FOR SHEET METAL AND CAST BUTTONS

Ten pounds 2 oz. Quick Running Gray Spelter Solder to 1 pound 10 oz. Burnt Borax. Shell must be cleaned before solder mixture is applied with small brush around the eye of button. The Solder mixture should set before going to the Gas Furnace to be fused. Button is then pickeled and cleaned for finishing. In some cases the manufacturers use blow pipes for fusing the solder rather than continuous or automatic gas furnace, which method takes about a minute and a half for Solder to fuse.

MELTING POINTS OF DIFFERENT GRADES CARRIED IN OUR STOCK

The temperatures given below represent the flowing point of the various grades of solder. They begin ot melt at a slightly lower temperature (about 30 C or 54 F) but run freely only when the temperatures noted below are attained.

21 to 25	874	1600	Yellow
39	"	"	"
40	"	"	"
51	"	"	"
41 to 45	"	"	"
61 to 65	825	1515	Gray
71 to 85	865	1590	"
81 to 85	874	1600	Yellow
91 to 95	850	1560	Gray
100 to 106	874	1600	Yellow
BB	770	1420	Black

FLUXES

FOR SOLDERING OR WELDING

Copper and Brass.....Sal Ammoniac
Iron.....Borax
Lead.....Tallow or Resin
Lead and Tin Pipes.....Resin and Sweet Oil
Tinned Iron.....Resin
Zinc.....Chloride of Zinc

Steel—Pulverize together 1 part of sal ammoniac and 10 parts of borax and fuse until clear. When solidified, pulverize to powder.

Soldering or Tinning Acid

Muriatic acid 1 pound; put into it all the zinc it will dissolve, and 1 ounce of sal ammoniac, then it is ready for use.

Metal—Marking Solution.—To give iron or steel a bright copper surface which will show distinctly the lines drawn by scriber, dividers, surface gage, etc., apply a marking solution composed of one ounce of copper sulphate, four ounces of water, and about one teaspoonful of nitric acid. (One ounce is equivalent to about eight teaspoonfuls.) Heating small pieces of steel to a blue will give a similar surface.

MEASUREMENT RULES

LENGTH

Side of square of equal periphery as circle = diameter × 0.7854.
Diameter of circle of equqal periphery as square = side × 1.2732.
Length of arc = number of degrees × diameter × 0.008727.

AREA

Triangle = base × half perpendicular height.
Parallelogram = base × perpendicular.

HEIGHT

Trapezoid = half the sum of the parallel sides × perpendicular height.
Trapezium, divide two triangles and find area of the triangles.
Parabola = base × 2/3 height.
Ellipse = long diameter × short diameter × 0.785.
Regular polygon = sum of sides × half perpendicular distance from centre to sides.
Surface of cylinder = circumference × length + area of two ends.
Surface of pyramid or cone = circumference of base × ½ of the slant height + area of the base.
Surface of a frustrum of a regular right pyramid or cone = sum of peripheries or circumferences of the two ends × half slant height + area of both ends.
Area of rectangle = length × breadth.

SOLID CONTENTS

Prism, right or oblique = area of base × perpendicular height.
Cylinder, right or oblique = area of section at right angles to sides × length of
Pyramid or cone, right or oblique, regular or irregular = area of base × 1/3 perpendicular height.
Contents of segment of sphere = (height 2 + three times the square of radis of base) × (height × .5236).
To find the volume of a cylinder: Multiply the area of the section in square inches by the length in inches = the volume in cubic inches. Cubic inches divided by 1728 = volume in cubic feet.
Solidity of a sphere = cube of diameter × .5236; or surface × 1/6 diameter.
Side of an inscribed cube = radius of a sphere × 1.1547.
Contents of frustrum of cone or pyramid = multiply areas of two ends together and extract square root. Add to this root the two areas and × 1/3 altitude.
Contents of a wedge = area of base × ½ altitude.

PRISMOIDAL FORMULA

A prismoid is a solid bounded by six plane surfaces, only two of which are parallel.
To find the contents of a prismoid, add together the areas of the two parallel surfaces and four times the area of a section taken midway between and parallel to them, and multiply the sum by 1/6th of the perpendicular distance between the parallel surfaces.

WEIGHT

Ascertain the number of cubic inches in piece and multiply same by weight per cubic inch. Or, multiply the length by the breadth (in feet) and product by weight in pounds per square foot.

1 cubic foot of water weighs 62 1/3 pounds and contains 7½ gallons.

1 gallon of water (U. S. Standard) weighs 8 1/3 pounds.

To find the capacity (U. S. gallons) of cylindrical tanks, square the diameter expressed in inches, multiply by the length and by .0034.

The pressure of still water in pounds per square inch against the sides of any pipe, channel or vessel of any shape whatever is due solely to the "head" or height of the level surface of the water above the point at which the pressure is considered, and is equal to .43302 pounds per square inch or 62.355 pounds per square foot for every foot of head.

Boiler horse power: The evaporation of 30 pounds of water per hour, from a temperature of 100 degrees Fahrenheit into steam at 70 pounds gauge pressure.

One pound of water evaporated from and at 212 degrees is equivalent to 965.7 British Thermal Units.

To find the number of square feet of heating surface in tubes: Multiply the number of tubes by the diameter of a tube in inches, by its length in feet, and by .2618.

To find safe working pressure of boiler: Multiply 1-6 of tensil strength of plate by the thickness of the thinnest plate in inches and divide by ½ the diameter of the boiler. This is for single riveting, to which add 20 per cent for double riveting when all the holes have been drilled.

Dear Friend:

We are happy to send you our 1950 catalog, in which we introduce our 1-1/2" scale steam locomotive.

Because of quantity buying we have not had to raise our prices, and in cases they have been lowered. The fine quality of our merchandise remains the same; we always get the very best bronze and cast iron, and shall continue to do so. And of course there is nothing on the market in this line as fine as our drawings and instructions for the engines we list.

We have to repeat in all of our literature that we do not have dealers, and out customers at all times deal direct with us.

Your patronage is appreciated, and we hope by our policy of prompt action and fair dealing to warrant your future orders.

Sincerely yours,

LITTLE ENGINES

GENERAL INFORMATION

All shipments weighing up to one pound will be prepaid in the United States; all weighing over one pound will be sent by express or freight, charges collect. (We might add that the freight or express charges are the same whether paid at your depot or at this end. In other words, these transport Companies make no charge for collecting the carrying charge when the goods are delivered to you.)

TERMS: Payment should be made by Post Office money order, or Cashier's check. Large orders will be shipped C.O.D. if one-half the total amount of the order is remitted with order. C.O.D orders are expensive to you so payment with order is really the better way. If more money is sent us than the total of the order, refund will be made at once, or proper credit given, as you wish.

PRICES are subject to change without notice, because the metal market price changes affect our prices. All prices and shipment dates quoted are contingent upon causes beyond our control.

We endeavor to ship all orders the same day they are received, and you will be notified of any delay and advised as to the probable date of shipment.

ORDER BLANKS are provided in the back of this catalog and are marked so that the blanks can be cut out without damaging the rest of the catalog.

Please write us your wants on anything special in the model line and we shall do all we can to supply your needs. Tell us your model troubles and we will try to help you.

We THANK our customers for their patronage and assure all of fair dealing and quick action on their orders.

ADDRESS all correspondence and make all remittances to:

LITTLE ENGINES
Box 15
Wilmington, California

A FEW PICTURES: The photographs appearing in this catalog were sent us by our friends whose names apper on the pictures.

Many other photographs are in our files but for one reason or another they could not be reproduced to properly show the engine to advantage. Photographs for reproduction should be on gloss paper. The size of the picture does not matter, as they can be enlarged if clear. We shall be glad to receive any snap shots or photographs our friends will send in and they will be reproduced in our literature from time to time to show others what has been done in model locomotive building.

INDEX

NOTICE: It is our habit to keep in touch with our builders, and we suggest that they write us often.

TO OUR CALIFORNIA CUSTOMERS:
Please add California Sales Tax. Th nk you.

Address all correspondence and make all remittances to:
LITTLE ENGINES
Box 0
LOMITA CALIFORNIA.

S P E C I F I C A T I O N S

3/4" SCALE STEAM LOCOMOTIVES

4-6-4 Pacific Type (#7777) 4-8-4 Mountain Type (#8888)

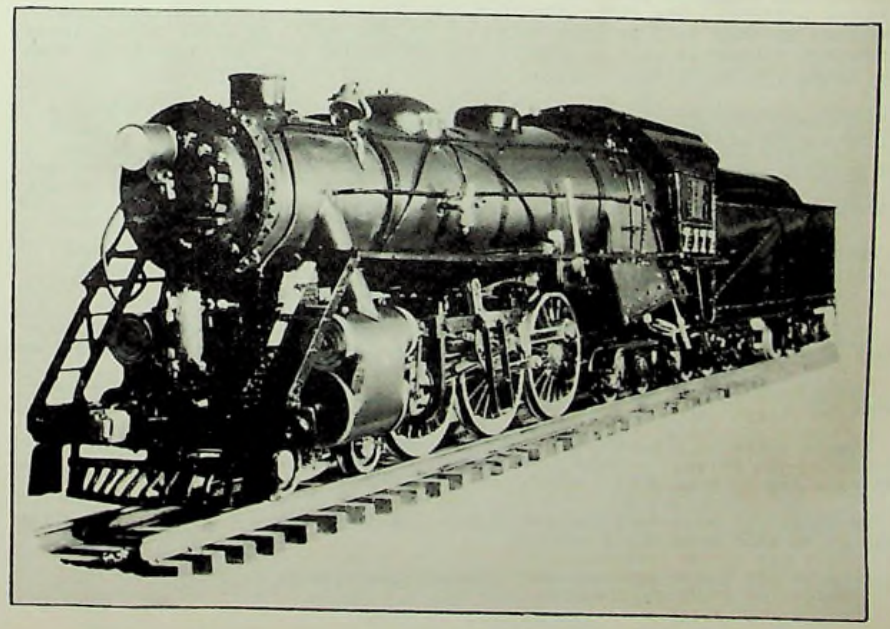
Track Gauge 3½"

	Class 4-6-4	Class 4-8-4
CYLINDERS 1 3/8" bore, 1 3/4" stroke	"	"
VALVES Piston, 3/4" dia. "Double Ported" with standard angular packing rings. Valve floats on stem.	"	"
Note: Cylinders and valve chamber castings for use with "D" type slide valve are available for both classes (see casting list).		
VALVE GEAR Walschaert, reversable from cab.	"	"
Travel 19/32". Lap 3/32", lead 1/64".	"	"
WHEELS, driver, 5" dia. on tread. Roller bearing Axles. Leaf springs and Equalizers.	"	"
WHEELS, leading truck (4) 1 7/8" on coil springs	"	"
WHEELS, trailer truck (4) 2 1/4" " " "	"	"
WHEELS, tender truck (6 to truck) 2 1/4" on coil springs	"	"
RIGID WHEEL BASE	11"	16½"
LENGTH of locomotive overall (approx.)	64"	72"
WEIGHT	200#	240#
BOILER (Prints & Instructions cover 2-types for each engine.	"	"
Flues, 19 steel, 1/2" O. D.	"	"
Combustion chamber type has 21 flues, 1/2" O. D.	"	"
Morrison type boiler has fire box 3⅛" dia. and 8 3/4" long. The grate area of the other boilers 5⅛"x8". All steel with welded joints throughout. Working steam pressure 90 lbs.		
Note: Our boilers of these types have been tested to 750# Hydrostatic pressures and 350# steam pressures. Calculated factor of safety 7 to 1.		
SUPERHEATER Coil type in smoke box	"	"
THROTTLE Slide valve style on smoke box.	"	"
FUEL Coal, distillate, diesel oil, gas or kerosene	"	"
TENDER Water capacity approximately 1½ gal	"	"
Fuel capacity approximately 1 gal.	"	"
Solid fuel type, 12 lbs.	"	"
Rectangular type tank	"	"
6-wheel trucks. Springs and equalizers	"	"
Wheel 2⅛" dia. on tread	"	"
Note: Tender water bottom casting available, see casting list.		
FEET WATER SUPPLY TO BOILER 2-injectors, one right hand and one left hand, or 1-injector and 1-steam driven pump		
HEADLIGHT Working electric, flash light battery under running board.	"	"

Minimum track radius ..... 30 ft.
Track gauge at curves to be widened 1/32". This relieves any bind that might occur between the track and wheel flanges.

	Class 4-6-4	Class 4-8-4
CAB Sheet steel with slidable windows. Removable section of roof to enable engineer to handle controls.	"	"
LUBRICATION Displacement type, either vertical or horozontal with needle valves for regulation of valve oil supply.		
BOILER FITTINGS in cab: Steam gauge, 0 to 200#	"	"
Water gauge	"	"
Blower valve left side	"	"
Blower valve and piping to allow outside source of comprssed air to furnish draft when "firing up".	"	"
REVERSE LEVER on quadrant right and left side	"	"
THROTTLE LEVER hung from cab roof, right hand side	"	"
SAFETY VALVES Two, 1 set 90# and 1 set 95#	"	"
WHISTLE 3/4" dia. chime, 3/16"-32 pipe connection. Standard lever type.	"	"

THESE LOCOMOTIVES develop approximately 1/2 H.P. Our builders report that their locomotives pull around 1500 lbs. This, of course, depends on the workmanship.



DRAWINGS AND INSTRUCTIONS

COVERING THE "STEP BY STEP" METHOD OF CONSTRUCTING THE 3/4" SCALE STEAM LOCOMOTIVES

Mountain Type 4-8-4 — Pacific Type 4-6-4

By Martin S. Lewis

The drawings and instructions listed below are especially prepared to show the thoroughness of our "STEP BY STEP" method of constructing a Live Steam Locomotive in miniature. This same system is used in our 1/4" and 1/2" scale Drawings and Instructions, and in them the work is covered just as thoroughly as the 3/4" scale, but space does not permit us to show the contents of their SECTIONS individually.

Of course it is realized that those who are familiar with steam locomotives, and know all about them, do not need our help, so it is rather to help the greater majority who have not had the opportunity to learn the details of that most fascinating of prime movers, the steam locomotive, that our "Step by Step" Method of miniature steam locomotive building is dedicated.

Those who are interested will find that our prints and text matter will be of great help because we describe the making of such items as the cylinders and other vital parts, so if one wishes he can make his own patterns and have the castings cast from them, and so build his engine from the "rails up".

As to the machine work, a number of our customers who had not the machine tools required have prevailed upon the mechanical training shops of the public schools in their locality to do that which was needed, for the instruction and experience the work gave the students, and at little or no cost to the builder for the finishing of parts. A great many of the parts can be file finished because we have endeavored to reduce the actual machine tool operations to a minimum for those who do not have machine tool facilities.

These Drawings and Instructions are reproductions, with much new material added, of the articles my Martin S. Lewis that have appeared in the Model Craftsman Magazine

This is the first time in the history of Model Making that a work of this kind has been made available at so low a price. You may send $1.00 for two of these 50¢ Sections and after you have had the opportunity of seeing their clearness and completeness, this $1.00 will apply on a Set of the Sections and you will receive the complete Set upon the receipt of an additional $8.00. (See order blank on last pages.)

THE COMPLETE SET OF DRAWINGS AND INSTRUCTIONS, in a neat folder, covering the construction of both the 4-6-4 Pacific type and the 4-8-4 Mountain type locomotives (the 15 Sections) is, prepaid,..... $5.00
(Or the Sections may be purchased separately at the price listed on each)

INDEX OF THE DRAWINGS AND INSTRUCTIONS

SECTION 1

MAIN FRAMES, pattern and machine details, 4-8-4
MAIN FRAMES, pattern and machine details, 4-6-4
FRAME BINDERS & SPREADERS, 4-6-4 & 4-8-4
DRIVE BOXES, 4-6-4 & 4-8-4
EXTENSION FRAMES
Section 1, 3 sheets of drawings & 3 sheets of instructions, prepaid... .50

SECTION 2

DRIVE AXLE details
DRAW BAR POCKET (between engine & tender) details
DRIVE BOX ROLLER BEARING CLAMPS, details
EXTENSION FRAME CROSS BAR details
PILOT BEAM details
Section 2, 2 sheets of drawings & 1 sheet of instructions.....

SECTION 3

SPRINGS, details
SPRING SADDLE details
DRIVE WHEEL pattern details
DRIVE WHEEL MACHINE WORK details
CRANK PIN details
DRAW BAR POCKET PATTERN details
DRAW BAR POCKET MACHINE WORK details
Section 3, 4 sheets of drawings & 3 sheets of instructions..... 50¢

SECTION 4

TRUCK FRAME PATTERN details (Trailing Truck)
TRUCK FRAME MACHINE WORK details
TURCK SPRING EQUALIZER details
UPPER SPRING SEAT details
COIL SPRING details
JOURNAL BOX details
AXLES, TRAILING & TANK TRUCK
ASSEMBLY OF TRAILING TRUCK
Section 4, 2 sheets of drawings & 2 sheets of instructions..... 50¢

SECTION 5

TRUCK FRAME PATTERN details (Leading Truck)
TRUCK FRAME MACHINE WORK details — 4-6-4 ERECTION PRINT
AXLES, details
WHEELS, details
SPRINGS, COIL
CENTER PINS
SIDE ROD PATTERN details
SIDE ROD MACHINE WORK details
Section 5, 2 sheets of drawings & 2 sheets of instructions..... 50¢

SECTION 6

VALVE MOTION DETAILS--DOUBLE PORTING, DETAILED DRAWING
GUIDE YOKES details
GIRDER BEAM details
REVERSE SHAFT LEVER details
LIFTER BLOCKS, details
RADIUS BAR details
COMBINATION LEVER details
ANCHOR LINKS, details
PILOT STEPS, details
PILOT details
GUIDE BARS, details (See Section 9)
Section 6, 2 sheets of drawings & 2 sheets of instructions..... 50¢

SECTION 7

VALVE LINKS & CYLINDER DETAILS
LINKS, details
LINK SIDE PLATES, details
LINK BRACKET, details
VALVE-STEM CROSSHEAD details
Section 7, 3 sheets of drawings & 1 sheet of instructions..... 50¢

SECTION 8

CYLINDERS, Pattern Making details
CYLINDERS "EN-BLOC", for piston valves, machine work details
CYLINDERS CAST SINGLY (to make machining easier on small lathes) Piston valve type, Machine work details
CYLINDERS SLIDE VALVE TYPE, cast singly, machine work details
CYLINDERS SLIDE VALVE "EN-BLOC" TYPE (Piston valve appearance) machine work details
VALVE CHAMBER HEADS, details
PISTON details
CROSSHEADS, details
Section 8, 3 sheets of drawings & 3 sheets of instructions..... 50¢

SECTION 9

VALVE GEAR, WALSCHAERTS
"Double Ported" makes for more steam-tight valves, special angular rings, masking valve "lands" allows more steam lap. (See Section 6)
VALVE DIAGRAM
Section 9, 2 sheets of drawings & 3 sheets of instructions..... 50¢

SECTION 10

BOILERS:

These prints and instructions cover the building of two types of locomotive boilers as per the general description below. The two boilers while slightly differing in construction are good steamers and as there are no flanged sheets used in any of these boilers, a great deal of work is eliminated. The all welded construction eliminates all rivets, which is another labor saving feature besides being in line with latest practice on full size engines. Boilers made by us have been tested at various pressures from 450# to 750# hydrostatically and the pressures generally used are up to 100#, which means a factor of safety of about 7 to 1.

Many of these boilers have been made by our customers and are giving excellent service, steaming freely under all working conditions with either solid, liquid, or gas fuel.

These drawings and instructions are for both 4-6-4 and 4-8-4 class locomotives.

BOILER #1 is a more elaborate boiler being along the conventional lines of the regular large boilers. All sections of the shell, fire box, throat and flue sheets are of mild steel. Welding is used throughout. No rivets. A combustion chamber of 3 3/4" seamless tube 3" long is specified for this boiler and there are 21 tubes of ½" OD seamless steel tubing. 19 flues are in the combustion chamber flue sheet and there are two additional ½" flues extending from the front fire box front sheet to the front flue sheet. Two circulating or arch tubes extend from the front fire box sheet to the back sheet for free circulation of water on the thermo-syphon principle. The fire box is stayed with 3/16" steel stays welded into the crown sheet and the fire box wrapper sheet. This boiler is an exceptional steamer with either solid, liquid or gas fuel. The smoke box is of seamless steel tube. Conventional dry pipe is provided to be connected to a smoke box steam dryer or superheater.

BOILER #3 does not have a combustion chamber but is of the regular rectangular fire box tube in common use. Mild steel sheet is used in all boiler courses except the front section which is of seamless steel tube. The flues are of 1/2" O. D. seamless steel tubing. The smoke box is also of seamless steel tube. Like the other boiler, it is a 19-flue job with all welded throughout and arch or circulating tubes can be applied if desired. There is one slope sheet in the shell near the center and by distributing the asbestos lagging any desired outline or contour can be had.

Section 10, drawings and instructions for Both the boilers for 4-6-4 and 4-8-4 classes of locomotives..... $1.00

SECTION 11

CAB AND BOILER FITTINGS, details
CAB details
DOME details
LAGGING OF BOILER details
ERECTION PRINT, 4-8-4
Section 11, 3 sheets drawings, 2 sheets of instructions..... 50¢

SECTION 12

SIX WHEEL TENDER TRUCK details
TENDER TRUCK FRAME details
SPRING SEATS, details
CENTER PINS, details
Section 12, 1 sheet drawings and 1 sheet of instructions..... 50¢

SECTION 13

TENDER FRAME details
WATER BOTTOM TENDER UNDER FRAME details
Section 13, 2 sheets of drawings and 2 sheets of instructions..... 50¢

SECTION 14

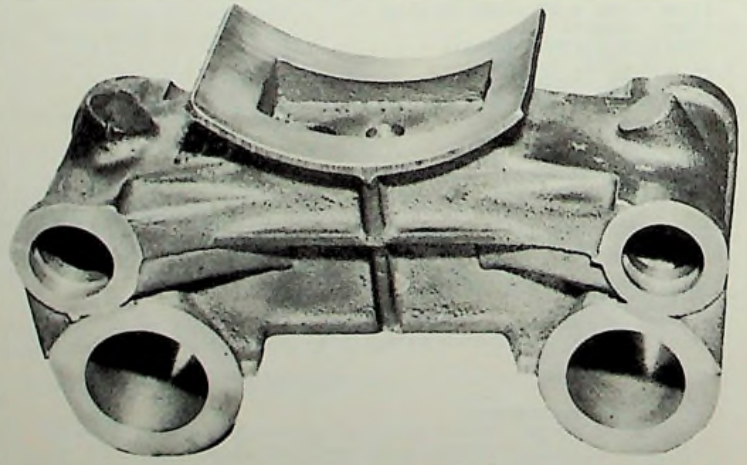
TENDER TANK covered in detail
Section 14, 2 sheets of drawings and 2 sheets of instructions..... 50¢

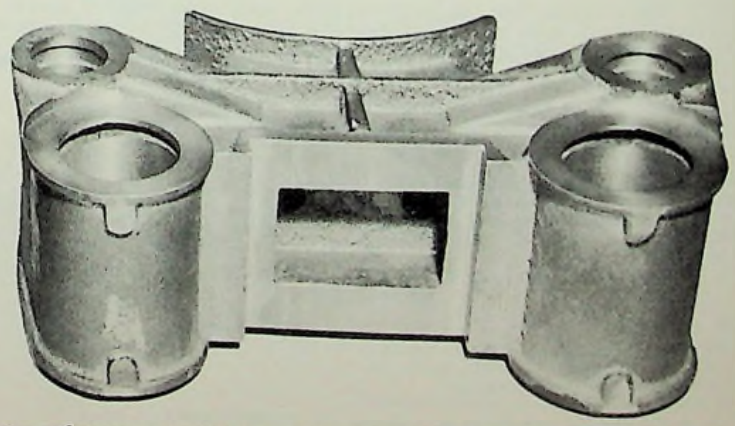
SECTION 15

SPECIAL DRAWINGS & INSTRUCTIONS

OIL BURNER, details
PILOT PLATE
REVERSE LEVER & QUANDRANT details
HINTS ON LOCOMOTIVE OPERATION
BELL details
LADDER details
PIPING details
(See MISC.CASTING LIST for: water gauges injector, pump, couplers, etc.)

Section 15, 5 sheets of drawings and instructions..... 50¢





Cylinder block 7826-A, two views, shown machined (see page 7)

CASTINGS FOR 3/4" SCALE STEAM LOCOMOTIVES
Classes 4-6-4 (#7777), 4-8-4 (#8888)
These castings may be purchase one at a time, or in Sections
(All castings in the rough)
ALL OF OUR CASTINGS ARE EITHER BRONZE OR CAST IRON, AND ARE OF THE VERY BEST QUALITY

CAST-ING #	SECTION 1	METAL	Required for Engines 4-6-4	4-8-4	Approximate Weight	Price Each	PRICE Engine #7777 per set	PRICE Engine #8888 per set
71	Main frames.....	Bronze	2		5#ea	$5.00	10.00	
81	Main frames.....	"		2	7 "	5.50		$11.00
782	Drive boxes, inner half..	"	6	8	½ "	.60	3.60	4.80
873	Drive boxes, outer half..	"	6	8	½ "	.60	3.60	4.80
785	Equalizer levers.....	"	4	6	½ "	.40	1.60	2.40
Precision cut & punched spring leaves			6	8	(See page 28)	.40	2.40	3.20
							$21.20	$26.20

DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER

	SECTION 2							
784	Draw bar pocket, between engine and tender....	Bronze	1	1	1½#	1.50	1.50	1.50
788	Drive wheels, spoked...	Cast iron	6	8	3½#	1.35)	8.10	10.80
*788A	Drive wheels, Disc-pok	"	" 6	8	4#	1.35)		
7812	Pilot beam.....	"	" 1	1	2#	1.50	1.50	1.50
#786	Draw bar pocket, back and front..	Bronze	2	2	½#	1.00	2.00	2.00
							$13.10	$15.80

DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER

	SECTION 3							
7813	Trailer truck frame...	Bronze	4	4	1#ea	1.00	4.00	4.00
7814	Truck journals, for trailer & tank trucks...	"	16	16	1# "	.30	4.80	4.80
7815	Wheels, leading truck.	C. Iron	4	4	½" "	.50	2.00	2.00
7816	Wheels, rear trailer and tank.....	C. Iron	16	16	1" "	.50	8.00	8.00
							$18.80	$18.80

DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER
WE CAN FURNISH THE FOLLOWING CYLINDER CASTINGS
(See pages 6 & 8)

7826-A Cylinder and valve chamber casting, for piston valves. This is an "En-bloc" type. Both cylinders are cast in one unit so that there is no splice joint between them. All exhaust and steam ports are cored in the casting. All of our cylinders are cast of "Meehanite", a cast iron alloy well known for its fine machining qualities. Weight.. 12 lbs per casting. Price per casting..(see photo on page 6)..... $20.00

7826-B Cylinders, CAST SINGLY, Piston Valve Type. These cylinder castings are produced to meet the requirements of those builders whose lathe will not swing the "En-bloc" casting, but who can swing and bore these cylinder castings separately and then bolt them together. The exhaust passages are cored in the blocks, the passage ending at the exhaust stand-pipe base. The steam passages are "cast in" and the cylinder bushings, or liners enable one to drill the steam ports accurately around the bush-ings circumference. After these ports are drilled, the bushings are pres-sed into the cylinder. These are of Cast "Meehanite" too. The weight of the two halves is 12#, and the price of the complete block (2 halves)$20.00

7831-A Cylinders, SLIDE VALVE TYPE: Piston valve apperance, Slide valves are easier to make and keep steam tight so we have brought our these casting for those who prefer the slide valve to the piston valve. These cylinders are "En-bloc" type in which the two cylinders are cast in one unit, so that there is no joint or splice between the two cylinders thus saving considerable machine work. Weight 12#. (see photo on page 8)
Price for complete block..... $20.00

7831C Steam chests for above cylinder block, 2 bronze.....$6.50
8731D Slide valves " " " " 2 "..... 1.00

*See page 25 for pictures.

(3/4" Scale Casting List Continued)

CAST-ING #	SECTION 4	METAL	Reguired for Engines 4-6-4	4-8-4	Approximate Weight	PRICE Each	PRICE Engine #7777 Per Set	PRICE Engine #8888 Per Set
7830	Cylinder Bushings.....	C.Iron	2	2	5#	.90	$1.80	$1.80
*7829	valve chamber bushings.	"	2	2	"	.90	1.80	1.80
7828	Cylinder head front....	Bronze	2	2	½#	.60	1.20	1.20
7827	Cylinder head back.....	"	2	2	½"	.60	1.20	1.20
*7831	Valve chamber hd. front	"	2	"	½"	.60	1.20	1.20
*7832A	" " " back with valve steam cross head guide cast on.....	bronze	2	2	1#	1.00	2.00	2.00
7833	Crossheads.....	"	2	2	½#	.85	1.70	1.70
7845	Cylinder head cover, front	"	2	2	½#	.60	1.20	1.20
7846	" " " back	"	2	2	½#	.60	1.20	1.20
*7847	Valve chamber cover, front	"	2	2	½#	.60	1.20	1.20
*7848	" " " back	"	2	2	½#	.60	1.20	1.20
7834	Crosshead gibs.....	"	4	4	½#	.35	1.40	1.40
7826X	Piston blank castings	C.Iron	2	2	1#	.50	1.00	1.00
							$18.40	$18.40

* If you are using the slide valve Cylinder Casting (7831-A) you will not need the castings in Section 4 that have this star before the number. If you are using the Piston Valve Cylinder Casting you will need all of Section 4. (So the castings that you do not have to buy in this section when using the Slide Valve Cylinder block, more than offset the price of the slide valves and steam chests that you do have to buy with your $7831-A block)

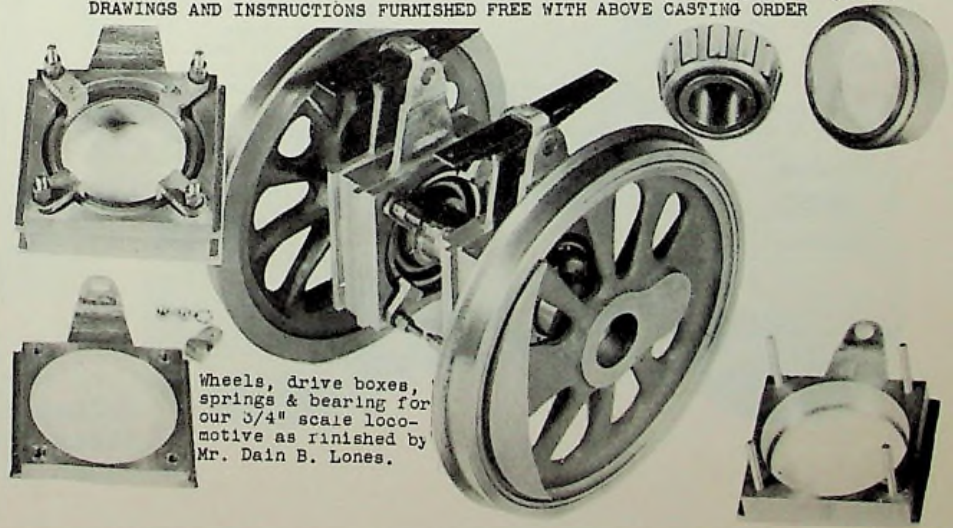
DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER

	SECTION 5							
7817	Leading truck frames....	Bronze	2	2	1#	1.00	2.00	2.00
7822	Main rods.....	"	2	2	1#	1.10	2.20	2.20
1723	Side rods, back.....	"	2	2	1#	1.00	2.00	2.00
825	Side rods, intermediate.	"		2	1#	1.00		2.00
1724	Side rods, front.....	"	2	2	1#	1.00	2.00	2.00
							$8.20	$10.20

DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER

	SECTION 6							
7800	Pilot casting..... (see page 34 for print)	Bronze	1	1	1#	2.00	2.00	2.00
7818	Girder beam.....	Bronze	1	1	1#	1.25	1.25	1.25
7819	Pilot steps.....	"	2	2	1#	.75	1.50	1.50
7820	Guide yokes.....	"	2	2	1#	1.50	3.00	3.00
7851	Girders.....	"	4	4	1#	1.00	4.00	4.00
7837	Lifter levers, in group.	"	5	5	1#	.40	2.00	2.00
							$13.75	$13.75

DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER



Wheels, drive boxes, springs & bearing for our 3/4" scale locomotive as finished by Mr. Dain B. Lones.

(3/4" Scale Casting List Continued)

CAST-ING #		METAL	Required for Engines 4-6-4	4-8-4	Approx-imate Weight	Price Each	PRICE Engine #7777 Per Set	PRICE Engine #8888 Per Set
	SECTION 7							
7821	Eccentric rods.....	Bronze	2	2	½#set	.65	$1.20	$1.20
821B	Combination levers.....	"	2	2	¼# "	.35	.70	.70
821C	Anchor link.....	"	2	2	½# "	.50	1.00	1.00
821D	Radius bar.....	"	2	2	½# "	.80	1.60	1.60
821E	Link side plates.....	"	4	4	½# "	.50	2.00	2.00
							$6.50	$6.50
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER							
	SECTION 6							
7836	Front end door.....cast iron		1	1	½#ea.	1.00	1.00	1.00
7835	" " " ring.....	"	1	1	½# "	1.50	1.50	1.50
789	Sand box.....	bronze	1	1	1# "	1.50	1.50	1.50
7811	Steam or cleanout dome..	"	1	1	½# "	1.50	1.50	1.50
7810	Generator & popvalve housing.....	"	1	1	1# "	1.75	1.75	1.75
7810	Smoke stack.....	"	1	1	1# "	1.75	1.75	1.75
							$9.00	$9.00
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER							
	SECTION 9							
7839	Bell yoke.....	"	1	1		1.00	1.00	1.00
7840	Bell frame.....	"	1	1		.75	.75	.75
7841	Bell.....	"	1	1		.90	.90	.90
7841A	Bell crank.....	"	1	1		.10	.10	.10
	SECTION 10						$2.75	$2.75
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER							
7842	Tender frame bottom: Using this casting does away with making the tank frame of channel section metal.	Bronze	1	1	19½lbs	$17.00	$17.00	$17.00
7801	Tender steps.....		4	4	1 lb.s	1.00	4.00	4.00
787	Tender tank truck frames	"	8	8	10 0z.e	.90	7.20	7.20
7843	Tank truck center plate.	"	2	2	8oz.pr.	.50	1.00	1.00
7844	" " frame center plates..	"	2	2	" " "	.50	1.00	1.00
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTING ORDER						$30.20	$30.20

MISC. CASTINGS:

7850 COUPLER & KNUCKLE 3/4" scale, bronze castings. These make up into a semi-automatic coupler of fine appearance and is a very practical working coupler to add a finished appearance to your engine. DRAWINGS AND INSTRUCTIONS included. Price each (1 coupler & knuckle).. 1.00
(SEE PAGE 35) Price per pair..... 2.00
for 3/4" and 1" scale engines.

7858 SMOKE BOX THROTTLE, bronze casting, in group. This is a very tight and efficient slide valve type throttle for 3/4" scale engines. It is to be mounted just back of the stack on the smoke box. The throttle valve can be covered with a dome if you like. Complete set of 5 castings $3.50

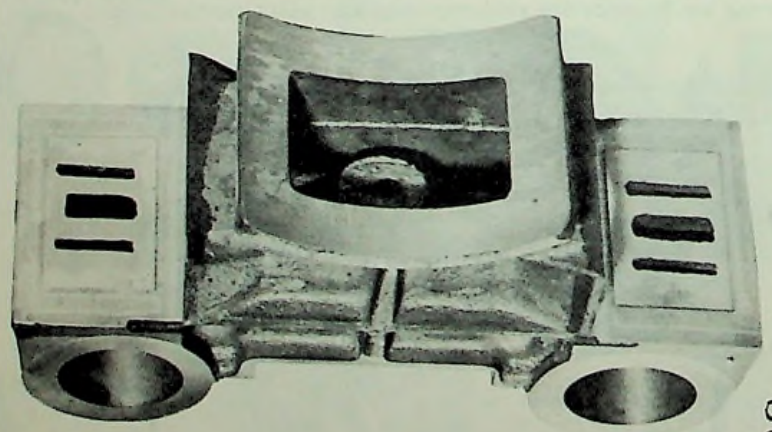
7849 INJECTOR (use 2 if desired). Castings in bronze. All castings including injector body, jets, nuts and glands are on a "stick". For 1/2" and 3/4" scale engines. DRAWINGS AND INSTRUCTIONS for making and operating are included for..... $3.00

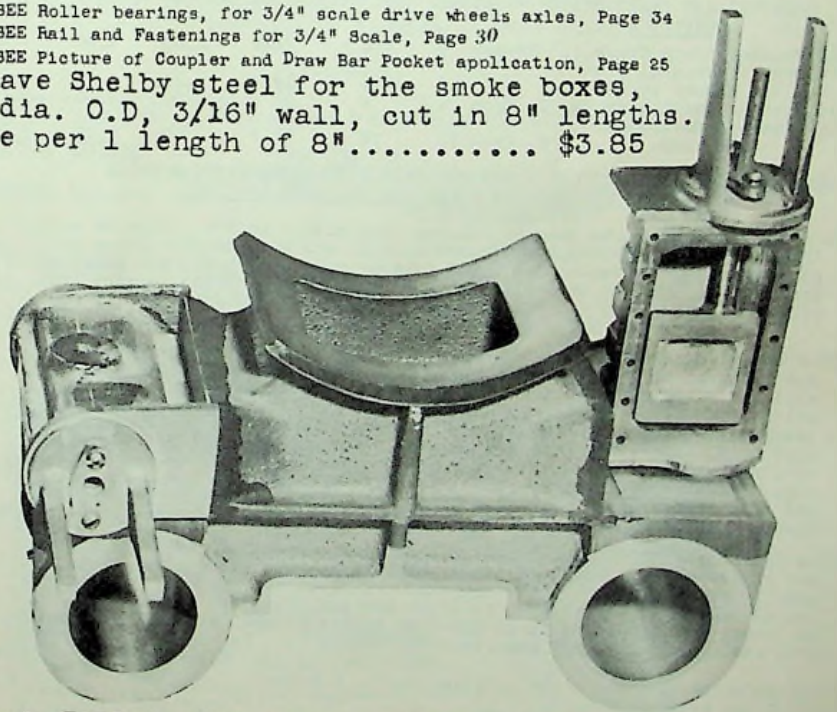
WG78 WATER GAUGE castings in bronze. Standard square type, includes plate glass strip with enough for extra. Also includes the necessary screws. Bottom cock or valve can be selected from boiler and pipe fitting section of catalog. This gauge is suitable for 3/4" and 1" scale engines. DRAWINGS AND INSTRUCTIONS INCLUDED..... $3.00

7854 HAND FEED WATER PUMP, castings in bronze, and all necessary metals, screws and valves to make up one of these handy pumps. 3/8" bore x3/4" stroke. For emergency hand feed water pump or for testing boilers. DRAWINGS AND INSTRUCTIONS INCLUDED..... $3.50

SEE Roller bearings, for 3/4" scale drive wheels axles, Page 34
SEE Rail and Fastenings for 3/4" Scale, Page 30
SEE Picture of Coupler and Draw Bar Pocket apolication, Page 25

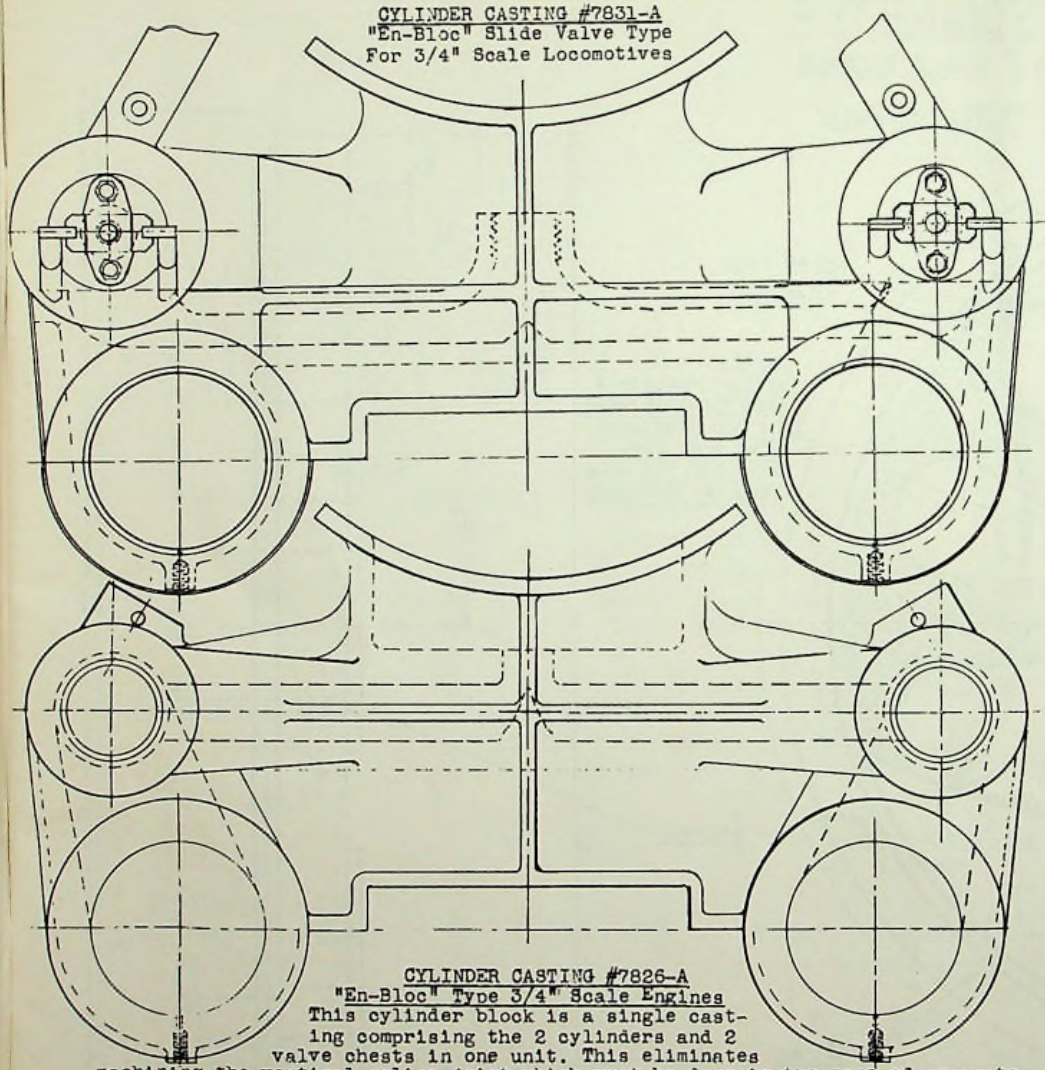
We have Shelby steel for the smoke boxes, 5½" dia. O.D, 3/16" wall, cut in 8" lengths. price per 1 length of 8"..... $3.85





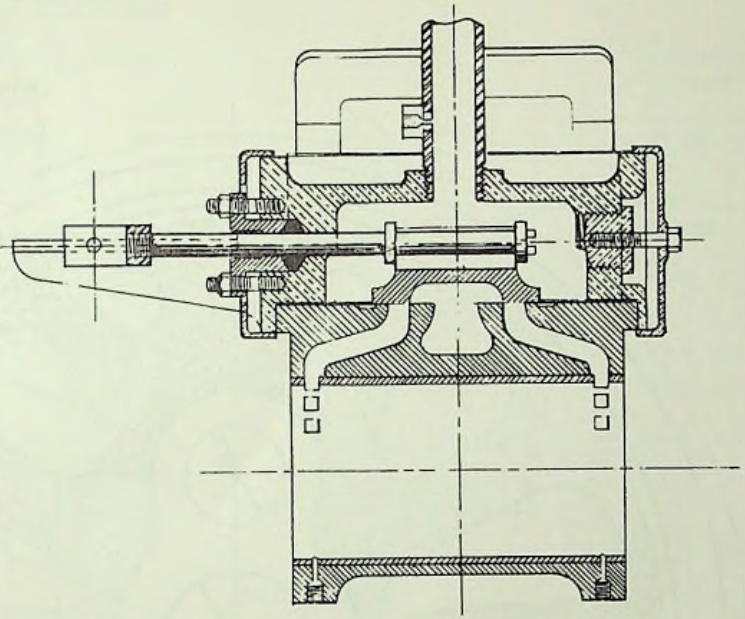
Cylinder block 7831-A, two views, shown machined. Steam Chests(7831C) and slide valves (7831D) shown in application. (See page 7)

CYLINDER CASTING #7831-A
"En-Bloc" Slide Valve Type
For 3/4" Scale Locomotives



CYLINDER CASTING #7826-A
"En-Bloc" Type 3/4" Scale Engines

This cylinder block is a single casting comprising the 2 cylinders and 2 valve chests in one unit. This eliminates machining the vertical splice joint which must be done in the case of separate cylingers. Then too, considerable work is also eliminated due to all steam and exhaust passages being "cored" or cast in. There is no drilling of steam or exhaust passages. These are of ample size to allow quick entry and quick exhaust for snappy performance. Due to the number of cores that have to be made and set during the moulding process, and to the fine, close grained, easy to machine Meehanite iron, the cost of the cylinders is somewhat higher than if the core work were eliminated. However, we wish to sell the best possible cylinder block, and we know you will be as pleased with this high grade cylinder as so many of our customers are who have written us high praise of this fine example of moulders' art.



CYLINDER CASTING #7831-A
"En-Bloc" Slide Valve Type

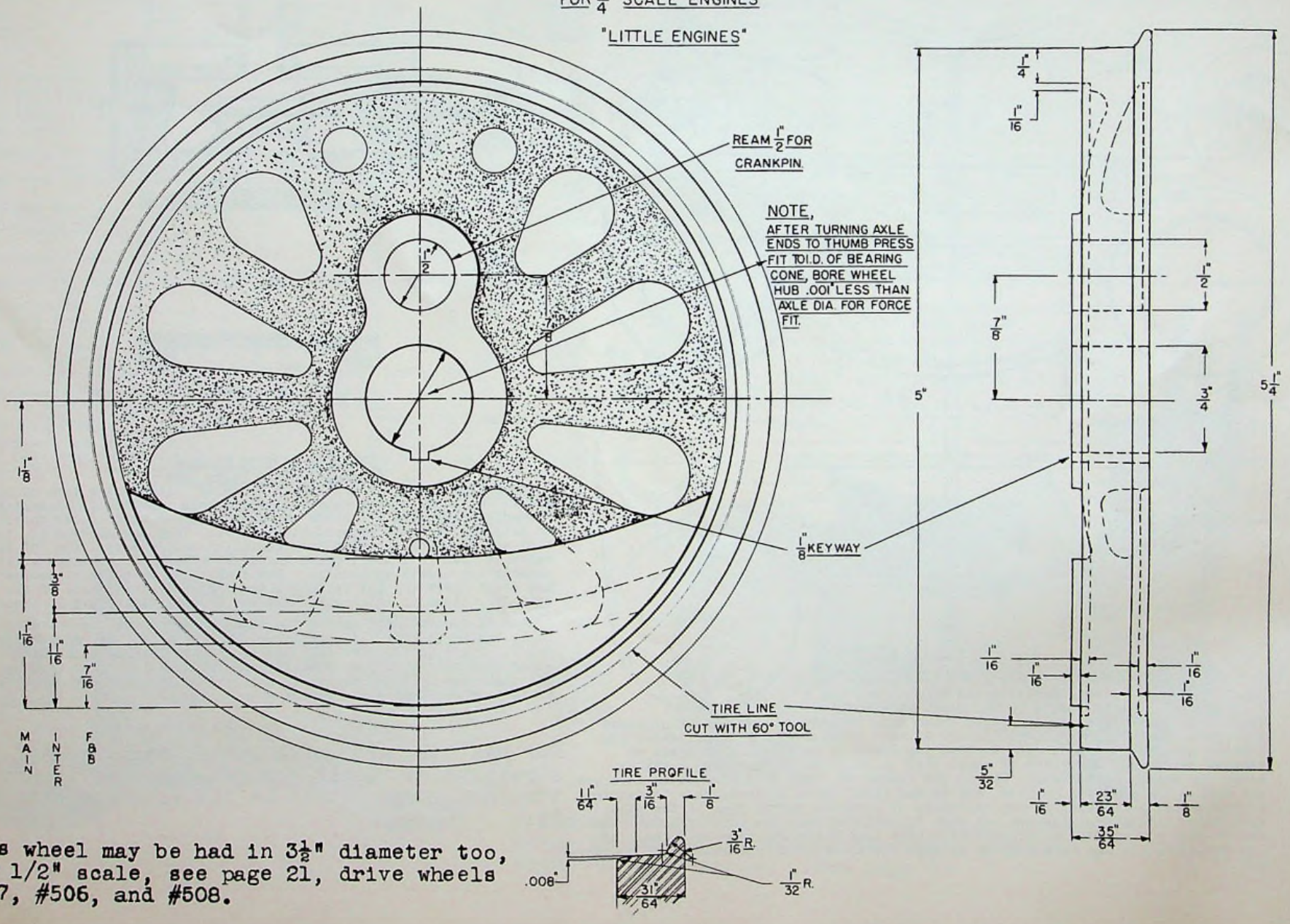
The sketch shows our 3/4" scale "En-Bloc" slide valve type of cylinder. Like our piston valve cylinder block this too is of cast Meehanite iron with all steam passages cored or cast in, so there is no drilling of steam or exhaust passages. They are already in, and they are of ample size for easy admission and exhaust. The "D" slide valve is used in a steam chest shaped to simulate the piston valve chamber for modern appearance. The drawing shows the application of the steam chest and the sectional drawing shows the inside of the cylinder, steam or valve chest and the D type slide valve in place.

Many of our builders prefer the slide valve to the piston valve as it is easier to make and maintain steam tight than the regular piston valve. There are special drawings to go with this cylinder block which show the valve gear details clearly dimensioned, so that you can apply the cylinder to any of our 3/4" scale locomotive chassis, or to your own design of running gear.

Our castings are not brittle, and are easily straightened, so if you get one that is not straight, just put it in the vise and straighten it.

LOCOMOTIVE DRIVE WHEEL
5" DIAMETER
FOR 3/4" SCALE ENGINES

"LITTLE ENGINES"

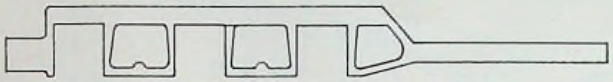


This wheel may be had in 3½" diameter too, for 1/2" scale, see page 21, drive wheels #507, #506, and #508.

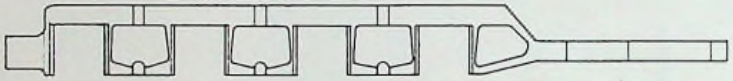
3/4" Scale Castings

(1)

SIDE FRAME NO.71
4-6-4CL



SIDE FRAME NO.81
4-8-4CL.



DRIVE BOX
OUTER HALF NO. 782

INNER HALF NO. 783

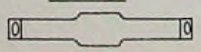
DRAW BAR POCKET
BET. ENG. & TENDER
NO. 784

EQUALIZER LEVER
NO. 785

DRAW BAR POCKET
PILOT & REAR OF TENDER
NO. 786

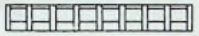
DRIVE WHEEL NO. 788
LIGHT & HEAVY COUNTERBAL.

PILOT BEAM
NO. 7812



TRAILING TRUCK FRAME NO. 7813

JOURNAL BOX NO. 7814
TRAILING & TENDER TRUCKS
(8CAST IN A "STICK")



WHEEL NO. 7816
TRAILING & TENDER TRUCKS

WHEEL NO. 7815
LEADING TRUCK.

LEADING TRUCK FRAME
NO.7817

PILOT STEP
NO. 7819

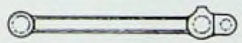
GIRDER BEAM
NO. 7818

GUIDE YOKE NO. 7820

ECCENTRIC ROD NO. 7821

MAIN ROD NO. 7822

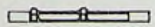
SIDE ROD NO.1723



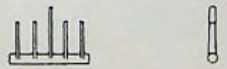
BACK SIDE ROD NO.1724

SIDE ROD NO.825

GIRDER NO.7851

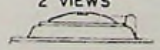


LIFTER & REV. SHAFT LEVERS
5 ON GROUP CSTG. NO.7837
2 VIEWS



FRONT END DOOR
AND RING

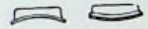
2 VIEWS



SAND BOX NO.789
2 VIEWS

GENERATOR & POP VALVE HOUSING
NO.7810 2 VIEWS

CLEAN OUT DOME
NO.7811 2 VIEWS



TENDER TRUCK FRAME
NO. 787

COMBINATION LEVER NO.821 B

ANCHOR LINK NO.821 C

RADIUS BAR NO.821 D

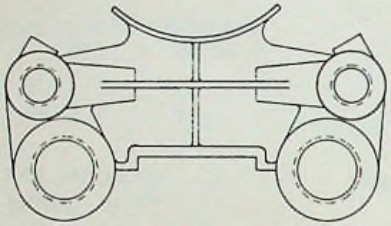
LINK SIDE PLATE NO.821E

—NOTE—
ALL ITEMS ARE SHOWN GREATLY REDUCED FROM FULL SIZE—

CYLINDERS FOR PISTON VALVES

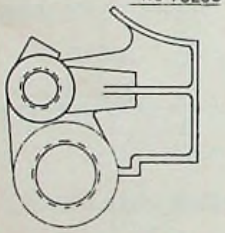
EN BLOC TYPE

NO 7826 A



HALF TYPE

NO 7826B



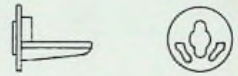
CYLINDER HEADS

REAR NO 7827

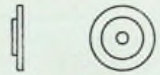
FRONT NO 7828

VALVE CHAMBER HEADS

REAR NO 7832

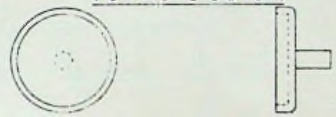


FRONT NO 7831



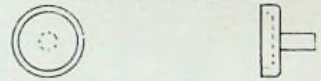
CYLINDER HEAD COVERS

F & R NO 7845 & 7846



VALVE CHBR HEAD COVERS

F & R NO 7847 & 7848



CROSSHEAD

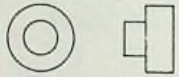
NO. 7833

CROSSHEAD GIB

NO 7834

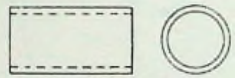
PISTON BLANK

NO 7826 X



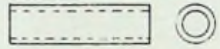
CYLINDER BUSHING

NO 7830



VALVE CHAMBER BUSH.

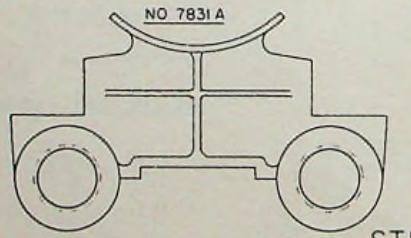
NO. 7831



CYLINDERS WITH STEAM CHESTS FOR "D" SLIDE VALVES

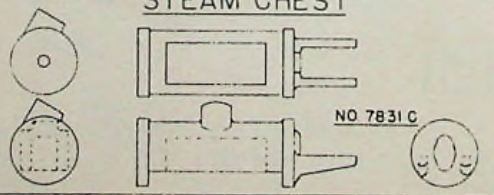
EN BLOC TYPE

NO 7831 A



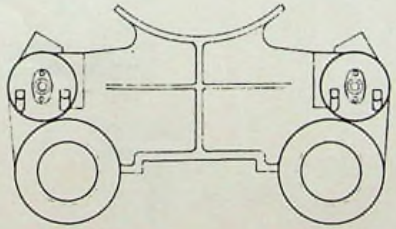
HALF TYPE

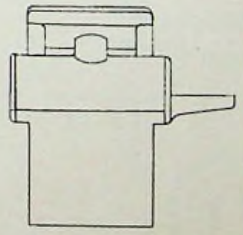
STEAM CHEST



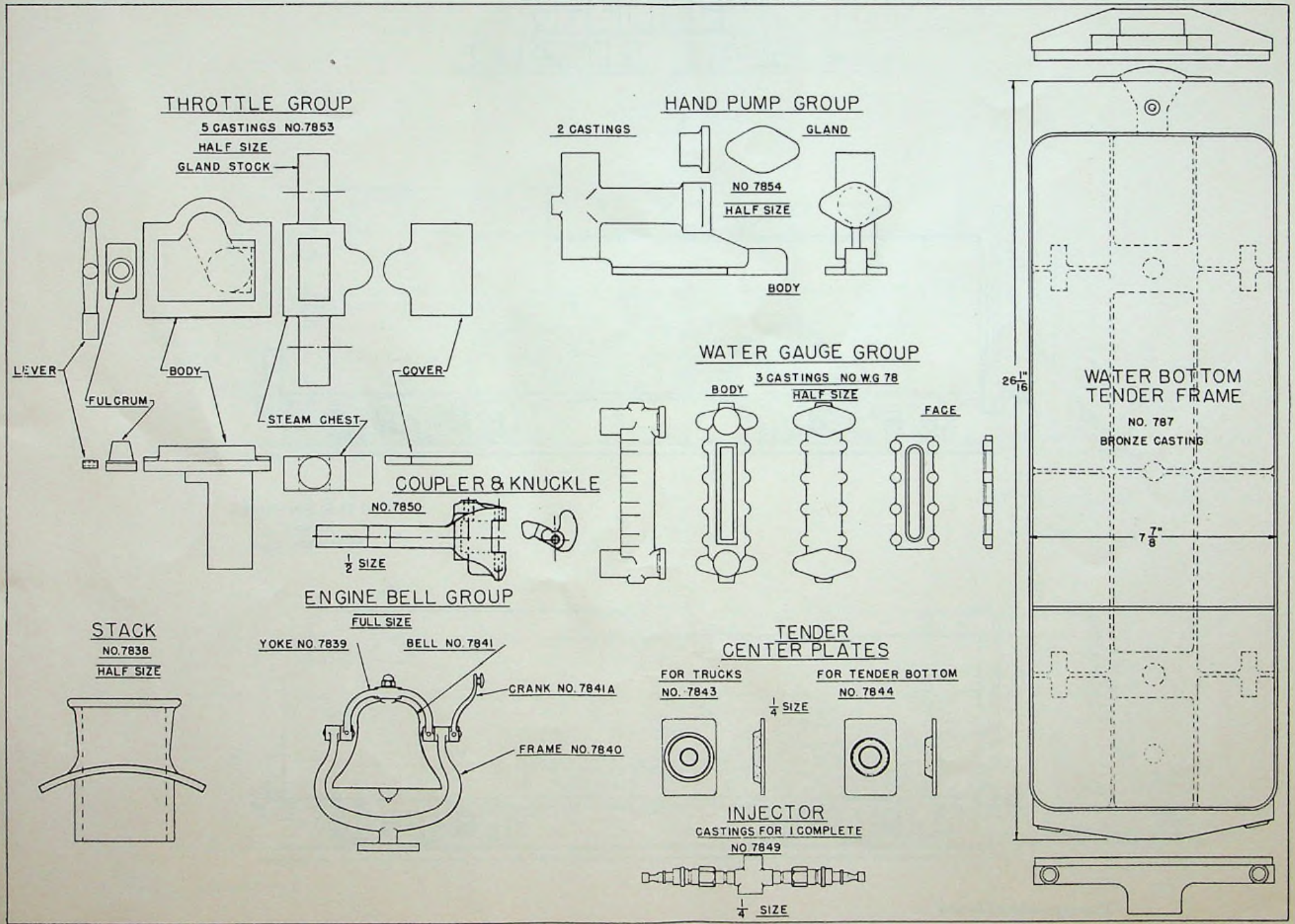
NO 7831 C

BELOW IS HOW THEY APPEAR WITH STEAM CHESTS APPLIED

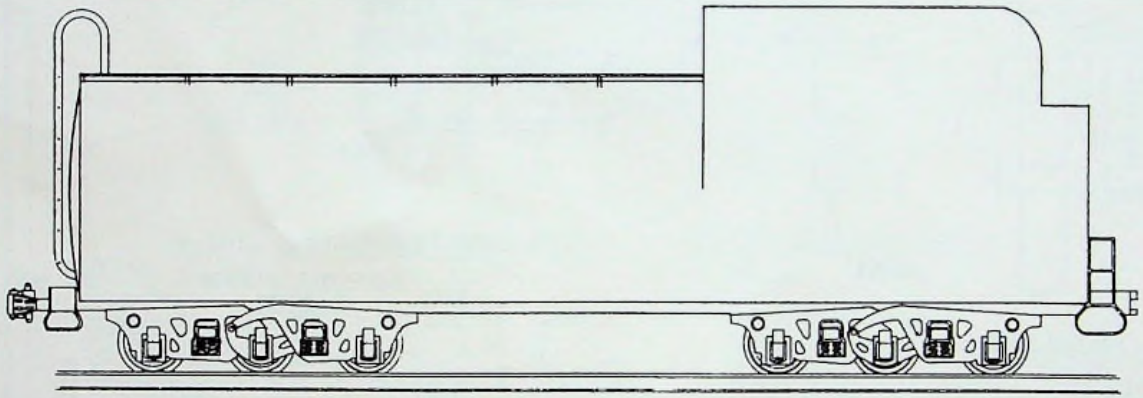




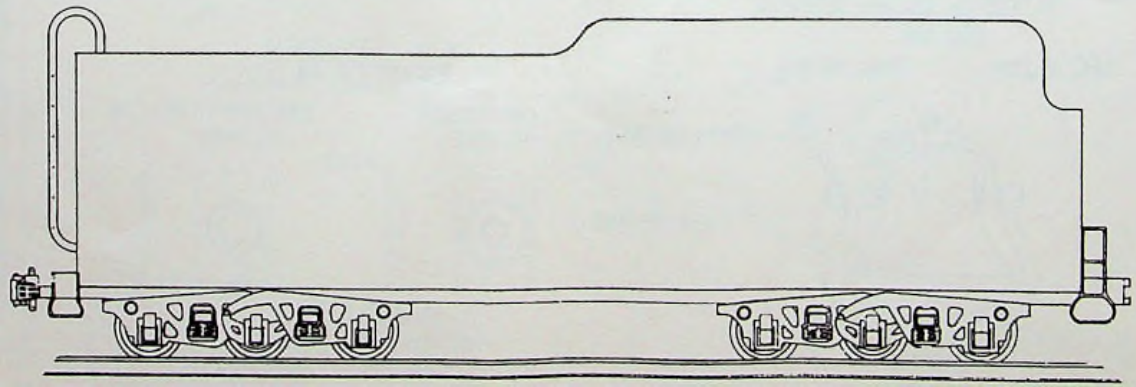
NOTE-
CYLINDER HEADS FIT BOTH TYPES OF CYLINDERS.
ALL ITEMS ARE SHOWN GREATLY REDUCED FROM FULL SIZE.


THROTTLE GROUP
5 CASTINGS NO.7853
HALF SIZE
GLAND STOCK
LEVER
FULCRUM
BODY
STEAM CHEST
COVER
HAND PUMP GROUP
2 CASTINGS
GLAND
NO 7854
HALF SIZE
BODY
WATER GAUGE GROUP
3 CASTINGS NO W.G 78
HALF SIZE
BODY
FACE
COUPLER & KNUCKLE
NO.7850
½ SIZE
ENGINE BELL GROUP
FULL SIZE
YOKE NO.7839
BELL NO.7841
CRANK NO.7841A
FRAME NO.7840
STACK
NO.7838
HALF SIZE
TENDER CENTER PLATES
FOR TRUCKS
NO. 7843
¼ SIZE
FOR TENDER BOTTOM
NO. 7844
INJECTOR
CASTINGS FOR 1 COMPLETE
NO 7849
¼ SIZE
26 1/16"
WATER BOTTOM TENDER FRAME
NO. 787
BRONZE CASTING
7 7/8"

TENDERS
1/4" SCALE 1 1/4" 0' GAUGE



LITTLE ENGINES
P. O. BOX 15
WILMINGTON, CALIF.

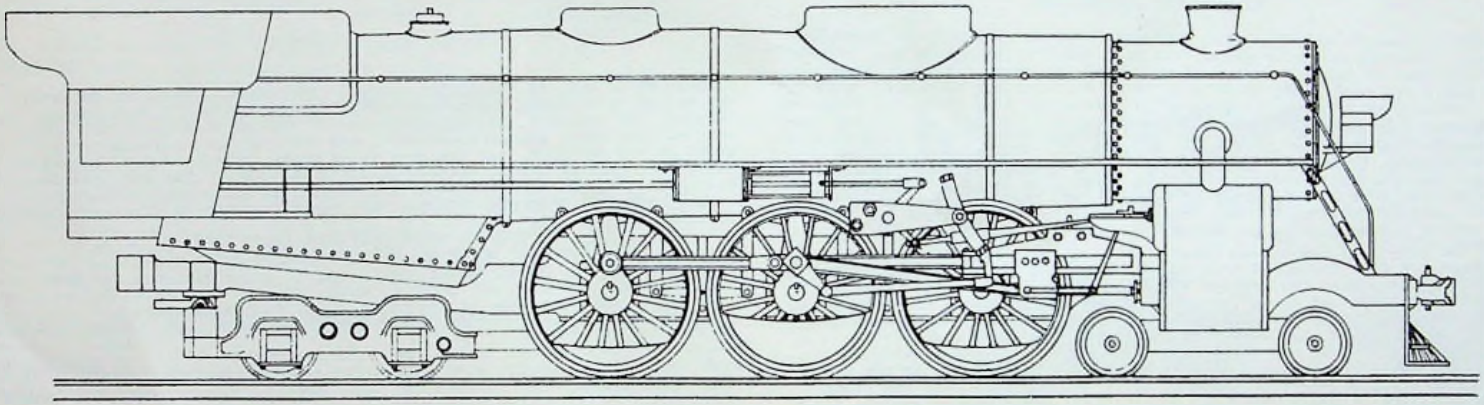


"Drawings reduced in size"

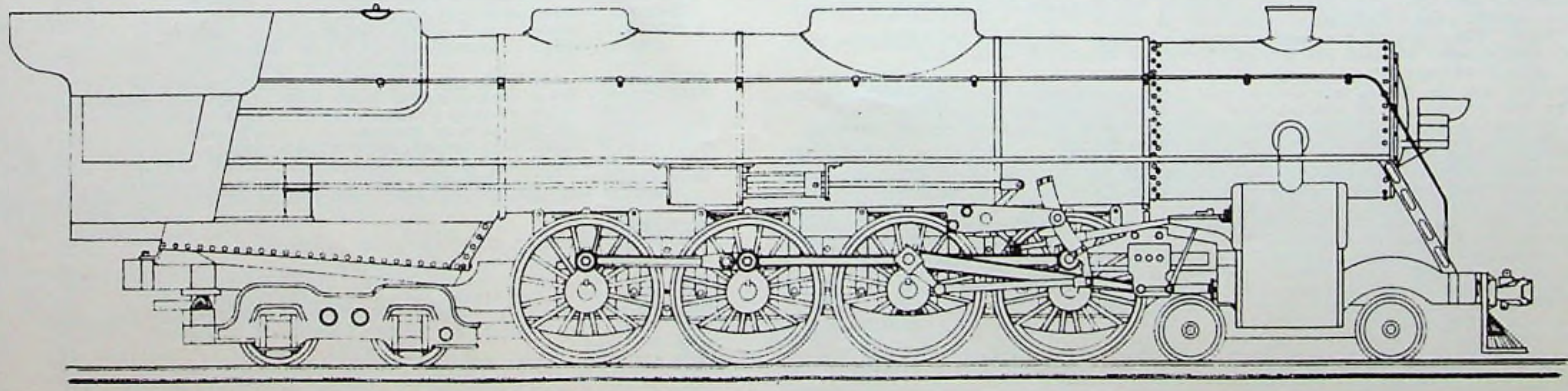
STEAM LOCOMOTIVES

1/4 SCALE 1 1/4"-0"-GAUGE

CL. 4-6-4

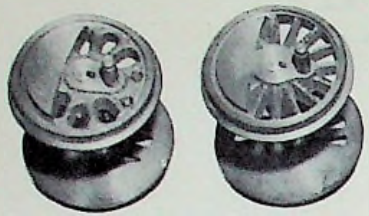


CL. 4-8-4



LITTLE ENGINES
P. O. BOX 15
WILMINGTON, CALIF.

"Drawings reduced in size"



STEAM LOCOMOTIVES

1/4 SCALE 1 1/4"-0"-GAUGE

CL. 4-6-4 CL. 4-8-4

Buckeye Tender Trucks

GENERAL INFORMATION

For those having limited shop facilities and a minimum space for trackage, we have designed and added these 1/4" scale, O-gauge, classes 4-6-4 Pacific type and 4-8-4 Mountain type steam locomotives. We have designed these engines for the average man--the man who has an inherent longing to build a real live steam locomotive and it is for him that the drawings and instructions are made as clear as we possibly could make them, together with the design, from the rails up, to enable the amateur to go through the construction "Step by Step".

FRAME: Both the 4-6-4 and 4-8-4 main frames are cast in unit, that is they are cast in one piece from the pilot beam to the back draw bar pocket and buffer beam. The unit castings make for greater strength, better alighnment, and they are easier to machine, because "pads" are cast at the cylinder seat and at all drive box jaws so that in finishing the frame side just these pads are filed or milled away to size. The top and bottom of the casting also has very little surface to finish. Several of our builders have file finished these surfaces in 1 -1/2 hours. Another advantage of this type is that it is finished in one piece whereas in engines using separate side frames it is necessary to bolt the sides together after they are finished, which is alright for larger models because there is a greater amount of metal in the frames and larger bolts can be used to make a rigid frame.

SPRINGS: All drive wheels have multiple leaf springs which operate on equalizers throughout the drive wheel system. Besides making the engine look more real, the springs really add to the running and traction qualities.

DRIVE WHEELS: These are of a very high grade cast iron alloy and are obtainable in the spoked type or in the box-poc type. The counter balances are heavy in the main drive wheels and the other wheels have lighter balances, as will be seen by scrutinizing the drawing on the front page (the assembly drawing). Drive wheels are supplied finished, quartered and mounted on axles and keyed with Woodruff keys and crank pins are installed and provided with screws and washers to hold the rods in place.

RODS: These are of the cast bronze fluted type and plenty of finish has been allowed so that you can get a final finish of excellent appearance.

LEADING TRUCKS: They are the rigid frame 4-wheel type as are the TRAILER TRUCKS, and the frames are articulated through the centerplate for smooth running. The TANK TRUCKS are of 6-wheel type with rigid frames but articulated through the center plate so that they travel smoothly over any unevenness in the track, adding to the finished and realistic appearance.

PILOT: This items can be had in cast type, or you can build your own.

BOILER: This is of seamless copper tube and has 5-flues, 3 of which are larger to carry the superheater pipes. There are no "tricky" sheets to "bump" out, because the flue sheets are lathe turned out of high grade bronze castings. There is no crown sheet in the boiler. The simplicity and efficiency of the boiler will please you, besides its construction is well within the scope of Mr. Average man. A suitable liquid fuel burner is described in detail in the drawings and instructions and alcohol, distillate, or high gravity Diesel fule can be used, although the alcohol is preferable from the standpoint of cleanliness.

VALVE GEAR: Is Walschaert type with a regulation reverse link in miniature operating the slide valves which are contained in a steam chest masked to appear the same as the conventional piston valve chamber. Slide valves are used because they are easier to make and a great deal easier to make steam tight then piston valves, especially in these smaller models. The slide valves are of bronze, operating on a Meehanite iron face.

CYLINDERS are of high grade cast iron and have "spigots" cast on them for ease in finishing. Valve stems and piston rods have packing glands to make them steam tight.

While we do not, in the strict sense of the words, offer time payments, our method of dividing the projects into "Steps" gives the same result, because, for instance, you buy a Section or two and work those up, then when you are ready you purchase more, and the cash outlay is not very great at any one time, and the cost is no more. Also, there is no extra charge for packing and no minimum placed on an order. You may order one item at a time, or one Section at a time, or the whole project at once.

WE DO NOT SELL COMPLETED LOCOMOTIVES, nor do we furnish more parts machine finished than listed.

"STEP BY STEP" CASTING & PARTS LIST
For 1/4" SCALE STEAM LOCOMOTIVES 4-6-4 & 4-8-4

Castings may be purchased one at a time, or in Sections, or Kits.
Castings are listed in the order in which they are used in so far as possible
(All castings in the rough unless otherwise stated)

	Class 4-6-4	Class 4-8-4
OUR CASTINGS ARE THE VERY FINEST BRONZE AND CAST IRON		
SECTION 1		
Precision cut and punched spring leaves (See page 28)	1.50	2.00
#961 Main frame, bronze unit casting for 4-6-4 locomotive	$3.50	
981 Main Frame " " " " 4-8-4 "		$3.50
Wheels: drive, finished, quartered and furnished with Woodruff keys, axles, crankpins, screws & washers and ready to assemble. Box poc or Spoked:		
1-1/2" dia. light counterbalance, for 4-8-4, 2 pr req.		7.00
1-1/2" dia. medium " " " 1 " "		3.50
1-1/2" dia. heavy " " " 1 " "		3.50
1-3/4" dia. light counterbalance, for 4-6-4 2 pr req.	7.00	
1-3/4" dia. heavy " " " 1 " "	3.50	
DRAWINGS AND INSTRUCTIONS SENT FREE WITH ABOVE SECTION	$15.50	$19.50
SECTION 2		
Pilot 4-wheel truck, 5/8"dia. tread, ready to assmble	2.75	2.75
Trailer, 4-wheel truck, Finished ready to assemble.....	3.25	3.25
Rods: all fluted, cast bronze, jointed type. Plenty of finish has been allowed. Set of 6 for 4-6-4.....	1.50	
Set of 8 for 4-8-4.....		2.00
#968 Cylinder cast Meehanite iron, 1 for either locomotive	1.75	1.75
968F 2 front and 2 back cylinder heads @ 25¢ each, cast bronze	1.40	1.40
2 steam chest covers, and material for slide valves..	1.00	1.00
9068 2 steam chests, cast of bronze.....50¢ each.....	1.00	1.00
9855 Link bracket, cast bronze, either locomotive.....	.85	.85
2 crosshead guide castings of bronze..... 30¢ each..	.60	.60
9860 Crosshead guide spreader, cast bronze, either locomotive	.60	.60
DRAWINGS AND INSTRUCTIONS SENT FREE WITH ABOVE SECTION	$14.70	$15.20
SECTION 3:		
9864 Smoke box front door, for either locomotive.....	1.50	1.50
9865 Stack, casting for either locomotive.....	.50	.50
9870 Sand box, for either locomotive, cast bronze.....	.50	.50
9871 Steam done, for either locomotive, cast bronze.....	.50	.50
9872 Generator housing "dummy", for either locomotive, bronze	.60	.60
9877 Pilot, cast bronze, for either locomotive..finished..	1.75	1.75
9873 Bell casting finished, ...	.60	.60
9874 Air pump, dummy, cast bronze, finished.....	.50	.50
9876 Hot water pump, dummy, cast bronze finished.....	.50	.50
9875 Couplers, full automatic, finished, per pair.....	1.25	1.25
Marker lights, ready to install, finished.....	1.35	1.35
DRAWINGS AND INSTRUCTIONS SENT FREE WITH ABOVE SECTION	$9.55	$9.5

(Continued at top of next page)

SECTION 4	4-6-4	4-8-4
Tender trucks, 6-wheel Buckeye, finished & assembled, 2 per tender	$4.25	$4.25
Steps, tender, front & rear, cast. ready to install, 4 req.....	1.60	1.60
1 sq. ft. 24 ga. sheet copper for tank work.....	1.70	1.70
NOTE: Above items required to complete either tender.	$7.55	$7.55

VANDERBILT TENDER PARTS: Frame casting..... $2.50
Tank partition castings, 3 @ 60¢..... 1.80
" front casting, upper, 2 @ 55¢..... 1.10
" front casting, 1 required..... .55
1 ft 2-1/4" 16 ga. OD brass or copper tube..... 2.00
PRICE OF PARTS FOR VANDERBILT TENDER..$7.95

Choose the tender you wish to build, and add the price to total of essentials listed above.

STANDARD TENDER PARTS: Frame & tank cast.(in unit) 7.00
2 Fuel tank ends..... .80
PRICE OF PARTS FOR STANDARD TENDER....$7.80

DRAWINGS AND INSTRUCTIONS SENT FREE WITH ABOVE SECTION

SECTION 5 Boiler material		
3 ft 3/8" OD 22 ga. copper tube for flues, 25¢ per ft.....	.75	.75
1 " 1-3/4" OD 16 ga. Copper tube, boiler shell.....	1.85	1.85
3 in. 1-5/8" OD 18 ga steel tube, smoke box.....	.40	.40
3 ft. 5/16" OD 22 ga copper tube, for flues....25¢ per ft.....	.75	75
3 " 5/32" OD 22 ga copper tube, for superheater... 20¢ per ft	.60	.60
6 in. 1/4" OD 16 ga brass tube, for water column.....	.15	.15
Jacket steel 70¢, asbestos lagging 40¢.....	1.10	1.10
1 ft square, 22 ga sheet steel for cab, 90¢, 2 doz hand rail knobs @ 45¢ per doz.....	1.80	1.80
2 flue sheet cast 90¢, 1 throat sheet cast 80¢, 1 back sheet cast	2.70	2.70
DRAWINGS AND INSTRUCTIONS SENT FREE WITH ABOVE SECTION.....	$10.10	$10.10

MISC. ITEMS SECTION 6:		
1 steam gauge (our #200).....	3.50	3.50
1 safety valve, parts with drawings and instructions for making	1.50	1.50
1 water gauge, " " " " " " "	1.50	1.50
1 set of throttle valve castings.....	1.25	1.25
1 set of hand pump castings.....	1.25	1.25
1 3/16" check valve, & 1/4" coupling & plug.....	1.65	1.65
6 in. 3/16" OD 22 ga copper tube for pump suction connection...	.15	.15
1 ft 1/8" ID Neoprene tube, for fuel line connection.....	.35	.35
2"x2" piece of brass screen for pump strainer.....	.20	.20
1 ft 3/16" ID rubber tube, for pump suction connection.....	.25	.25
1 hinged oil cup for manhole on tank.....	.35	.35
4 5/32"-36 street ells, 2 super-heater to dome con, 1 water gauge to boiler, 1 for super-heater to throttle.....	2.60	2.60
3 5/32"-36 unions, 2 superheater to dome, 1 superheater to throt.	1.35	1.35
1 1/8"-40 angle valve, for fuel valve on tender fuel line.....	1.35	1.35
2 1/8"-40 angle valves, 1blower connection to dome, 1 for burner.	2.70	2.70
3 1/8"-40 unions, 1for boiler con. to dome, 2 for throttle.....	1.35	1.35
5 1/8"-40 st.els. 2for throttle to steam pipes, 1for steam gauge con., 1 boiler feedwater con., 1 upper water gauge con..	2.50	2.50
2 1/8"-40 elbows, feed water con. and upper wate gauge.....	1.00	1.00
	$24.70	$24.70
MISC Metals, rod flat stock tubing, etc. needed (in kit).....	6.40	6.40
BOLTS AND NUTS NEEDED, washers, cotterpins, rivets, (in Kit)...	4.90	4.90
Rail, Our fine 618-T alloy, Duralumin, 5½¢ per ft... 100 ft....	5.50	5.50
Spikes for this rail are 75¢ per thousand.... 2000.....	1.50	1.50
Fish plates, (rail joints)... 40¢ per dozen..... 3 doz.....	1.20	1.20
A KIT CONTAINING ALL castings & items listed in Sections 1,2 3,4,5, and 6 with Misc Metals, Bolts and Nuts, etc. and rail, ties, spikes (for either locomotive) with full set of DRAWINGS AND INSTRUCTIONS.....	$106.15	$112.15

In order to avoid your having to order metals and misc. materials in small dabs as the work progresses, we have put these in a group which should be ordered with the first Section, because there are uses for some of these items throughout the course of construction and their uses are indicated in the Instructions and Prints. Metals are furnished in the smaller sizes in minimum lengths of 1 ft., so some will be left over, but these leftovers will be found handy for other projects.

*****

SPECIFICATIONS, TYPES 4-6-4 & 4-8-4 LOCOMOTIVES 1/4" SCALE

Cylinders, 1/2" bore, 5/8" stroke
Valve gear, Walschaert
Rigid wheel base 4-6-4 3 7/8"
Rigid wheel base 4-8-4 5 1/16"
Track gauge 1 1/4"
Truck leading 4-wheel rigid frame type
Truck trailing 4-wheel rigid frame type
Truck tender 6-wheel facsimile cast articulated frame
Length of locomotive and tender:
4-6-4 - 25 7/8"
4-8-4 - 26 7/8"
Steam pressure 0 to 100 lbs.
Curving radius, 56" minimum
SEE GENERAL INFORMATION

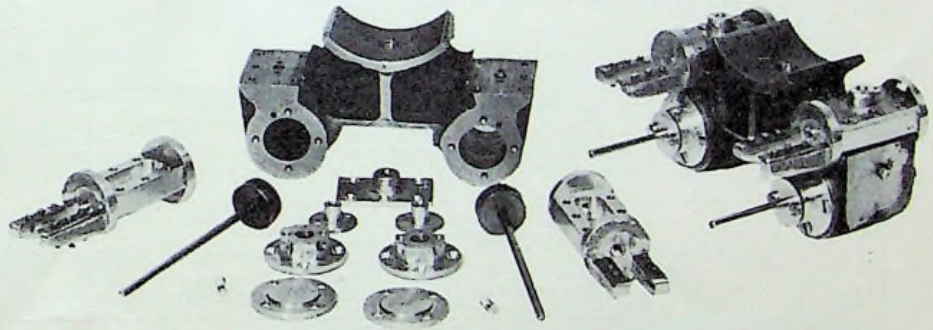
*****

DRAWINGS AND INSTRUCTION SETS COMPLETE: This offer is unusual in that the drawings and instructions cover both 1/4" scale steam locomotives, the 4-6-4 and 4-8-4 classes. These are by Martin S. Lewis in which he uses his "Step by Step" method of construction as originated by him. They are clear and complete and every step is covered thoroughly as the work progresses. They were written for the amateur builder with a limited amount of tools, and the work is so arranged as to make it easy for you to follow his design or use your own initiative in outline. It is our habit to keep in touch with our builders and we urge them to write us any questions at any time.

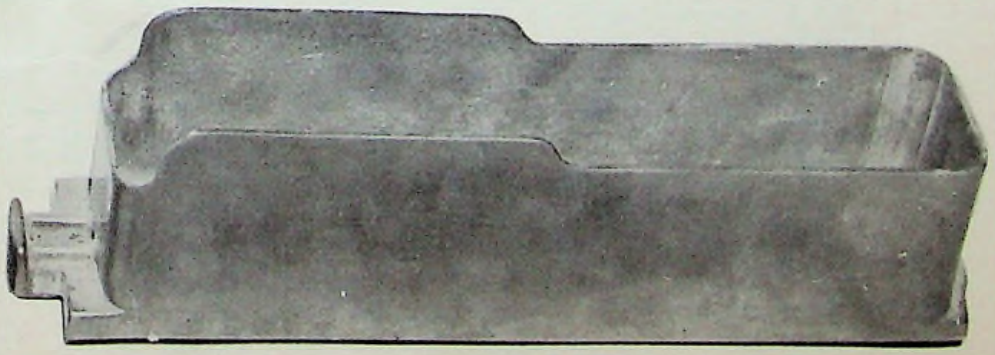
The complete Set of drawings and instructions, in Sections or Steps, so that each progressive step is in order and clearly understood..... $5.00

*****

(See order blank on last pages.)



CYLINDERS, PISTONS & STEAM CHESTS AS THEY LOOK WHEN FINISHED AND ASSEMBLED. (1/4" scale)

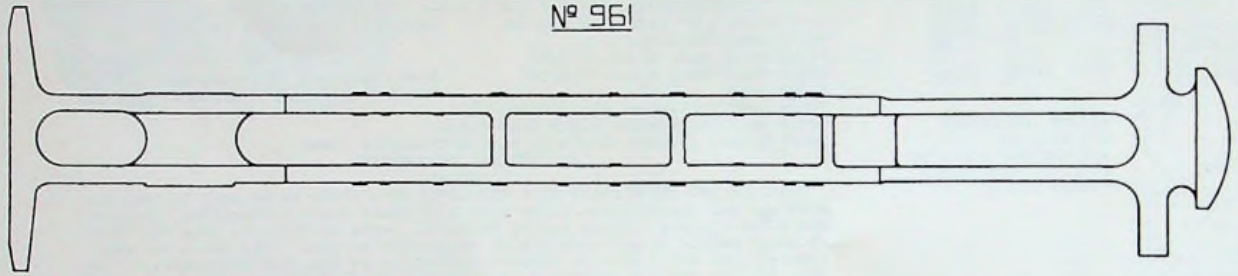


STANDARD TENDER TANK AND UNDER FRAME CAST IN UNIT 1/4" scale

1/4" SCALE STEAM LOCOMOTIVE CASTINGS

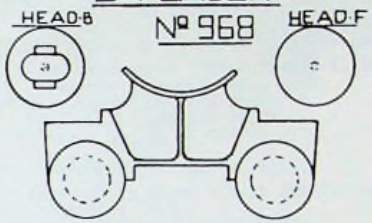
FRAME CL.4-6-4

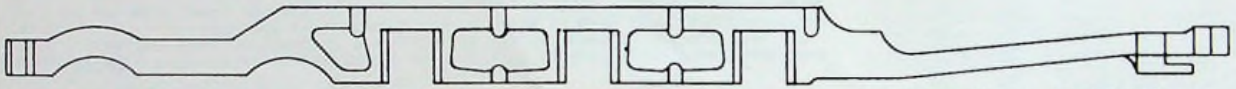
Nº 961



CYLINDER

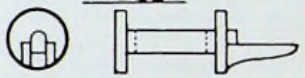
Nº 968





STEAM CHEST

Nº 9869



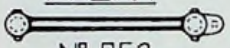
STACK

Nº 9865

SIDE RODS

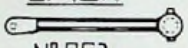
FRONT

Nº 962



BACK

Nº 983



SMOKE BOX FRONT

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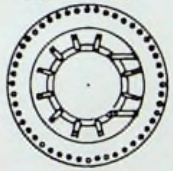
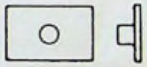


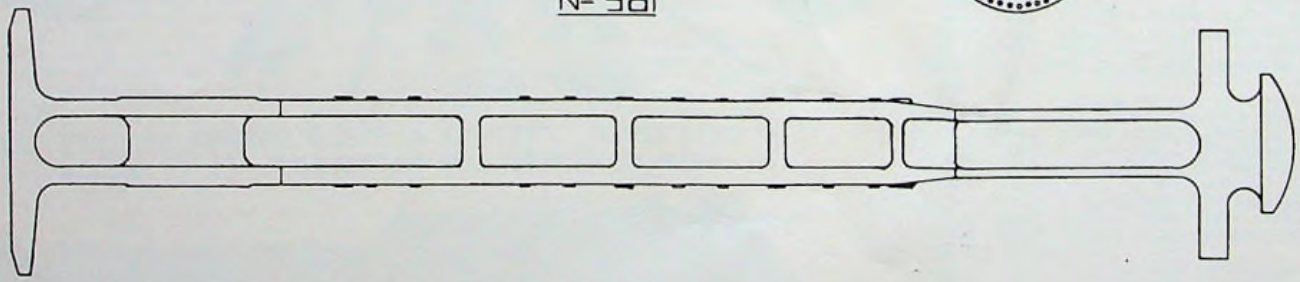
STEAM CHEST COVER

Nº 9868



FRAME CL.4-8-4

Nº 981



LINK BRACKET

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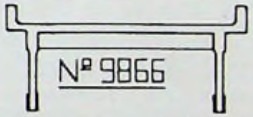

LINK BEARING

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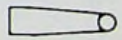
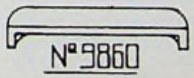
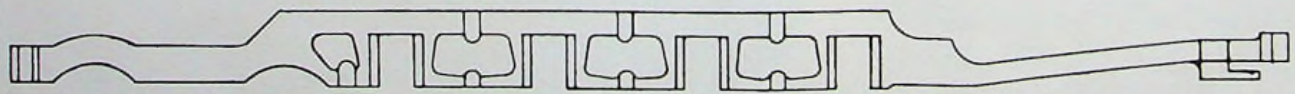


GUIDE SPREADER

Nº 9860

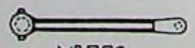




SIDE RODS

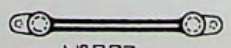
FRONT

Nº 982



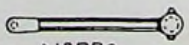
INTER

Nº 983



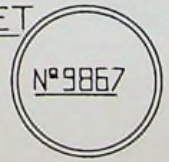
BACK

Nº 982



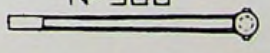
FLUE SHEET

Nº 9867



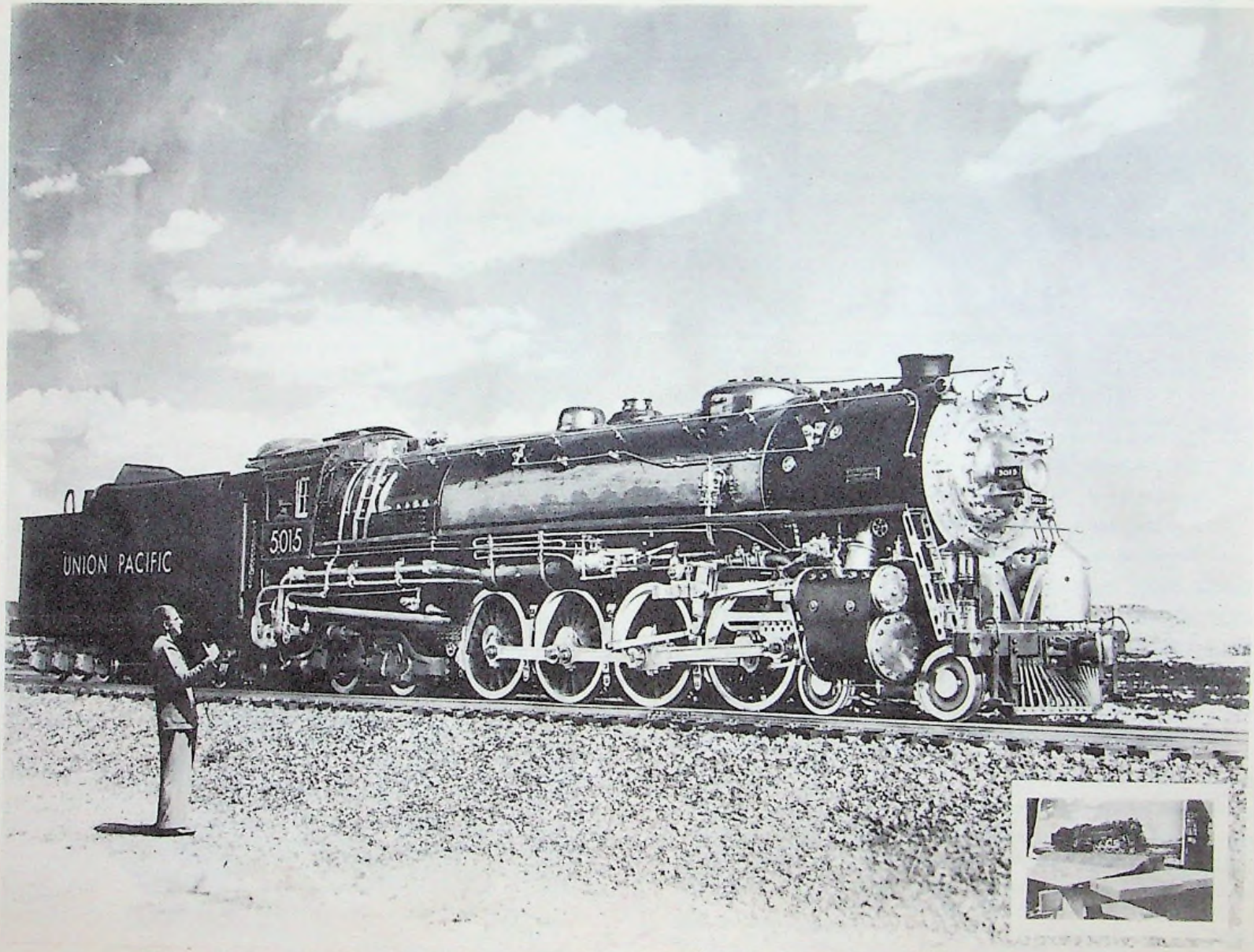
MAIN ROD

Nº 986

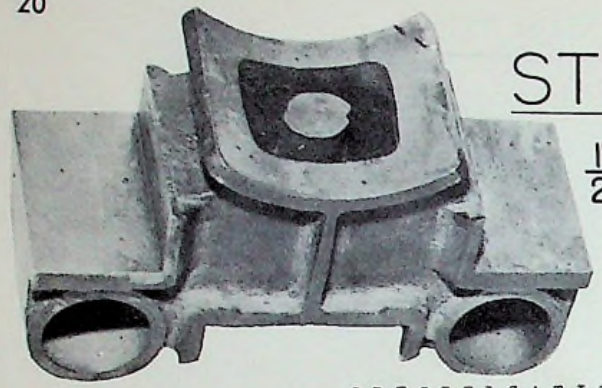


LITTLE ENGINES
P. O. BOX 11
WILMINGTON, CALIF.

"Drawings reduced in size"



This photo of Mr. Alfred Herman "thumbing" a ride on his 1/2" scale Union Pacific, 5015, is the result of Hollywood movie studio trick photography. The inset shows the process setting for the photograph. Mr. Herman lives in Hollywood, Calif.



STEAM LOCOMOTIVES

1" SCALE 2 1/2" TRACK GAGE.

4-6-2 4-6-4 4-8-2 4-8-4

THESE LOCOMOTIVES PULL LOADS UP TO 350 lbs.

Leading truck

S P E C I F I C A T I O N S

1/2" SCALE STEAM LOCOMOTIVES

4-6-2 Pacific Type 4-8-2 Mountain type

Track Gauge 2- 1/2"

CYLINDERS: Bore 1"x1-1/4" stroke (slide valve type)
Note: These cylinders are cored 3/4" so they can be bored to any diameter up to 1". This does not affect the valve gear.

VALVE GEAR: Walschaerts, reversible from cab. Valve travel, 1/2", and cut-off 75% of the piston stroke. Lap 1/8". No lead

WHEELS: Drivers 3-1/2" dia on tread. Plain bearing drive boxes.

" Leading truck (4), 1 -1/4" dia.

Trailing truck, (2 or 4) 1-3/4' dia.

Tender truck, 1-1/2" dia.

RIGID WHEEL BASE: 7-3/4" for 6-wheel chassis, 11-1/2" for 8-wheel chassis.

LENGTH OF LOCOMOTIVE 29-1/2" (approximate, only)

LENGTH OF LOCOMOTIVE TENDER: overall 51-1/2" (approximate)

WEIGHT: empty, 75#

BOILER: Copper, rectangular fire box of conventional type. Riveted and silver soldered. Flues 7, 1/2" Dia. (outside), copper tube. Great area 26.73 sq. in. Fire box inside 3-11/16"x7-1/4". Working pressure 50# to 75# . Steam dryer.

THROTTLE: Plug cock type.

FUEL: Kerosene or gasoline generating burner.

TENDER: Rectangular, conventional type with fuel & water tank.

WATER SUPPLY TO BOILER: Steam driven feed water pump and 1 injector.

HEADLIGHT: Located where preferred. Current from dry cell under footboard.

CAB: Sheet steel. Sliding windows may be installed.

LUBRICATION: Hydrostatic lubricators, one for each cylinder, mounted on foot boards, at front of cylinder or where desired.

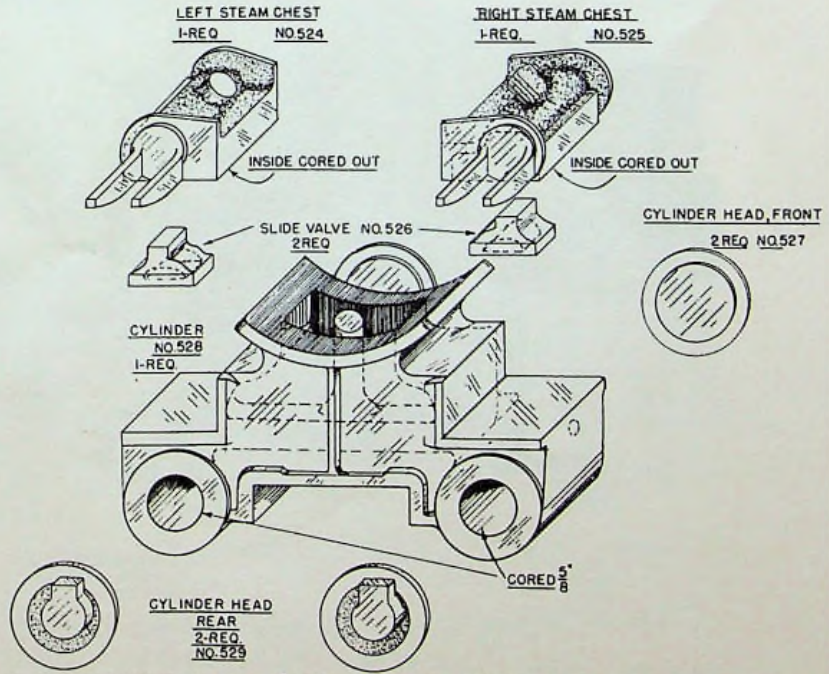
BOILER FITTINGS: In the cab: steam gauge 0 to 200# range. Water gauge, blower valve, injector valve. Fuel atomizer valve outside in steam line.

REVERSE LEVER: In cab, operating by reach rod through dummy reverse gear on right-hand footboard.

SAFETY VALVE: One, "pop" type set at 50#.

WHISTLE: 1/2" dia., 1/8"-40 thread end, lever type.

Minimum track radius..... 20 ft.
Track gauge at curve to be widened 1/64". This relieves any bind that might occur between the track and wheel flanges.



CASTINGS FOR 1/2 SCALE STEAM LOCOMOTIVE.

CYLINDER & STEAM CHEST GROUP.

Pilot beam and coupler

OUR CASTINGS ARE ALL THE VERY FINEST QUALITY BRONZE AND CAST IRON

CASTINGS FOR 1/2" SCALE STEAM LOCOMOTIVES

Pacific Type 4-6-2 & 4-6-4 Mountain Type 4-8-2 & 4-8-4

These castings may be purchased one at a time or in Sections (All castings in the rough)

THESE LOCOMOTIVES PULL LOADS UP TO 350 lbs.

CASTING #	SECTION 1	METAL	Required and Engines 4-6-2	4-8-2	Price Each	PRICE. Engine 4-6-2 Per Set	PRICE Engine 4-8-2 Per Set
502	Maine frames.....	Bronze	2		$3.75	$7.50	
501	Maine frames.....	"		2	4.25		$8.50
517	Crosshead guide bar spreader	"	1	1	.70	.70	.70
503-5	Drive wheels, spoked.....	C.Iron	6	8)			
506-8	Drive wheels, Disc-Poc	"	6	8)	1.15	6.90	9.20
	Drive boxes, made from 1 ft 5/16"x3/4" brass					.75	.75
Spring leaves, precision cut and punched, (see page 29)						2.10	2.80
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTINGS					$17.95	$21.95
	SECTION 2						
511	Main rods.....	Bronze	2	2	.70	1.40	1.40
514	Side rods, back.....	"	2	2	.70	1.40	1.40
512	Side rods, intermediate.....	"		2	.70		1.40
514	Side rods, front.....	"	2	2	.70	1.40	1.40
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTINGS					$4.20	$5.60
	SECTION 3						
	Leading truck:						
515	Truck frame, complete.....	"	1	1	3.00	$3.00	$3.00
509	Wheels 1-1/4" dia.....	C.Iron	4	4	.40	1.60	1.60
521	Journal boxes 1/2"x3/4"x1"...	bar stock, brass				.90	.90
	Trailing truck:						
516	Truck frame, complete.....	Bronze	1	1	4.50	4.50	4.50
510	Wheels, 1-3/4" dia.	C.Iron	2	2	.50	1.00	1.00
523	Journal boxes... 1"x3/4"x3" bar brass					.50	.50
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTINGS					$11.50	$11.50
	SECTION 4						
528	Cylinder casting, en-bloc...Meehanite		1	1	6.50	6.50	6.50
524-25	Steam chests.....	Bronze	2	2	2.00	4.00	4.00
526	Slide valves.....	C.Iron	2	2	.25	.50	.50
529	Cylinder heads, front.....	Bronze	2	2	.45	.90	.90
527	" " back.....	"	2	2	.45	.90	.90
518	Link bracket, spreaders 5 castings	"	1	1		2.75	2.75
	Pistons, 1-1/2" dia.....	C.Iron	2	2	.80	1.60	1.60
	Piston rings, 1.005"x3/32"..	"	4	4	.50	2.00	2.00
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTINGS					$19.15	$19.15
	SECTION 5						
522	Pilot beam.....	C.Iron	1	1	1.50	1.50	1.50
519	Front end door and ring.....	Bronze	1	1	2.00	2.00	2.00
520	Sand Dome.....	"	1	1	2.00	2.00	2.00
530	Steam dome cover.....	"	1	1	1.50	1.50	1.50
531	Fountain Housing.....	"	1	1	1.50	1.50	1.50
532	Smoke stack.....	"	1	1	1.50	1.50	1.50
	DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE CASTINGS					$10.00	$10.00
	SECTION 6						
	Tender truck:						
533	Tender truck wheels, for Buckeye truck, 1-1/2" dia. 12 req. @50¢						$6.00
615	Tender truck frames, Buckeye type, bronze, with journal boxes cast integral. 2 right-hand & 2 left-hand truck frames. 2 bolster castings. 1 center plate, & 2 equalizers (9 castings in all for 1 truck) 18 cast for 2 trucks.						$12.50
	6 ft. 1/4"x1/2", 14 ga. brass channel, for tender frame.....						2.10

TANK MATERIAL

For sides and ends, and baffle plates of water tank: 2 strips of hard rolled sheet copper 6"x36", 18 ga. dec. .049".....	5.95
For top and bottom of water tank: 2 strips hard rolled sheet copper 6"x24", 18 ga. dec. .049".....	4.95
For fuel tank (wrapper sheet and ends): 1 piece black Toncon steel, or cold rolled steel, 12"x6", 22 ga. dec. .03125".....	1.00
Water strainer: 1 68F, 1/8" I.P.S. to 3/16" connector, 1 pc. 1" of 1/4" copper tube, 1 pc. 1"x2" 80 mesh copper cloth.....	.70
Fuel strainer: 3" 5/8" hex. brass rod, 1 5-40x1/4" RH brass screw, 1"x2" 100 mesh copper cloth, 6" 3/16" copper tube, 6" 1/8"brass tub.	1.00
DRAWINGS AND INSTRUCTIONS FURNISHED FREE WITH ABOVE SECTION	$34.20

SECTION 7 (1/2" Scale Material list continued)

Boiler material, 1/2" scale:	
Boiler shell, 1 pc 3-1/2" O.D. 14 ga (.082) copper tube, 20".....	$7.50
Boiler back head.....)	
Boiler front flue sheet...) 1 pc. sheet copper, .0863" thick, 6"x2 ft...	3.50
Boiler back flue sheet....)	
Boiler inner door.....)	
Boiler crown sheet & side sheet, 1 sq ft 1/16" thick sheet copper....	3.50
Stay bolts..... 9 ft, 3/16" or 1/4" everdure bronze or copper rod..	1.95
Mud ring..... 3 ft of 1/4" copper rod, square.....	1.20
Flues, 7..... 3 lengths, 3 ft long 1/2" OD. 20 gauge copper tube...	2.43
1 dry pipe elbow, 100 B Imperial, 1/8", 90 degree.....	.60
1 " " Nipple.... 1 ft of 1/8" brass pipe standard.....	.30
1 fire pan..... 1 ft square 20 ga steel.....	1.00
1 piece angle iron for fire pan, 1"x1/4"x3/4"x1/16" channel steel to be cut in two pieces by builder.....	.35
Fire clay..... 2 lbs refractory furnace cement.....	.60
1 exhaust stand pipe... 6", 1/2" hex brass rod.....	.50
1 smoke box..... 6" long for 4-6-4, 10" long for 4-8-4, (specify which needed) 3-3/8" O.D. steel tube, 1/8" wall.....	1.75
1 oil burner..... pc brass bar 1/4"x1/2", 2" long.....	.15
1 " " piping..... 3 ft 1/8" brass tube, 22 ga.....	.60
Asbestos for lagging.....	.40
Jacket steel..... 75¢, Cab material --22 Ga sheet steel 12"x18"..2.00	2.75
6" of 1-3/4" O.D. copper tube, for steam dome.....	1.00
1 lb of 3/32"x1/4" round head copper rivets for boiler.....	2.25
	$32.33

SECTION 8

Dry pipe to throttle fittings:	
1 Imperial shutoff valve (as throttle) 1/8".....	1.25
1 " pipe cap, brass, 1/8".....	.40
1 " coupling " , 1/8".....	.40
1 Special tee, which we make, 1/4"-32x1/4"-32x5/16", brass,.....	1.50
2 1/4"-32 st elbows, 2 bushings & 2 unions, for steam pipes.....	2.50
4 1/8"-40 unions, 3 elbows, 2 globe valves, 2 st elbows, for oil burner connections.....	5.05
1 Steam gauge, our #200..... See page 23.....	3.50
*Materials for making pop valve, with Drawings and Instructions.....	1.50
*Materials for making steam driven feed water pump, with thorough drawings and written instructions (Pump #3, P.25)..	9.00
*Materials for making injector, with thorough drawings and instructions	3.00
3 ft of brass tube, 1/8" O.D. 22 ga ... for piping.....	.60
3 " " copper " 3/16" " " " ... " "	.45
*Materials for making lubricators, with drawings and instructions, 2...	4.00
	$33.15
MISCELLANEOUS:	
Couplers, cast bronze, semi-automatic, with Drawings and instructions.2	1.50
Rail, "Duralumin" 3/8" high, ... 12¢ per ft.....	
Spikes, for 1/2" scale..... 500.....	.90
Fish plates, (rail joints) bolt on type.... each plate.....	.05
Ties, 5/16"x7/16"x4-1/4"..... 100.....	1.50

DRAWINGS & INSTRUCTIONS SET COMPLETE: These cover the construction of the 1/2" scale steam locomotives, classes 4-6-2, 4-8-2, 4-6-4 & 4-8-4. This work is by Martin S. Lewis in which he uses his "Step by Step" method of construction as originated by him, and is written for the amateur builder with a limited amount of tools. This is arranged so as to make it easy for the builder to follow Mr. Lewis' design, or use his own initiative in outline. Many pictures are included showing the work in the course of construction. This complete set of drawings and instructions, bound in neat folder...$3.00

NOTE: We can furnish a 4-wheel trailing truck frame which is cast in one piece and designed to finish with a minimum amount of work--it can be finished with a file and drill press. This truck makes it possible to make the 4-6-4 and 4-8-4 class, 1/2" scale locomotive. The following castings and parts may be purchased in kit, or by the item, as follows: 9535 4-wheel trailing truck cast in one piece, bronze..$5.75, #610 wheels cast iron 1-3/4" dia. 4..$2.00 6" of 3/4"x1" brass for journal boxes--$85¢, 3" of 3/4" drill rod for rollers 25¢, 4 sets of spring leaves (#1,2,3,4,&5)..$1.00..Complete kit $9.85

*See page 27.

1" SCALE STEAM LOCOMOTIVE CASTINGS

NOTE,
THESE DRIVE WILL FINISH TO
3 1/2" DIA. TREAD
3 3/4" DIA. OVER FLANGE

INTERMEDIATE
NO. 504

DRIVING WHEELS
CAST IRON

MAIN
NO. 503

FRONT & BACK
NO. 505

TRUCK WHEELS
CAST IRON

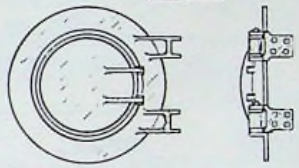
LEADING
4 REQ. PER ENGINE.

NO. 509

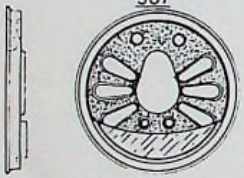
TRAILING.
2 REQ. PER ENGINE

NO. 510

FRONT END DOOR & RING
CAST BR 1 REQ.
INCLUDING HINGES
NO. 519



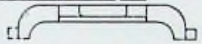
2 REQ FOR 4-8-2
NO. 507



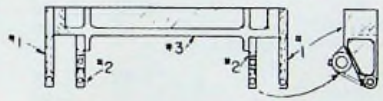
2 REQ FOR 4-8-2
2 " " 4-6-2
NO. 506

4 REQ FOR 4-8-2
2 " " 4-6-2
NO. 508

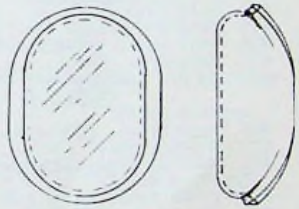
CROSSHEAD GUIDE BAR SPREADER
NO. 517-1 REQ CAST BR.



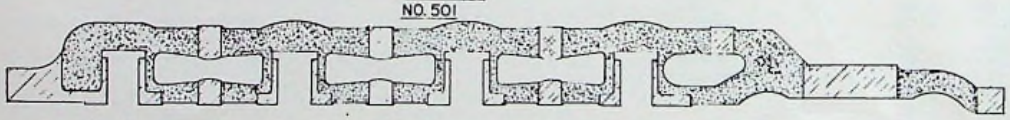
LINK BRACKET SPREADER
GROUP (5) BR CASTINGS REQ NO. 518



DOME
CAST BR
1 REQ
NO. 520

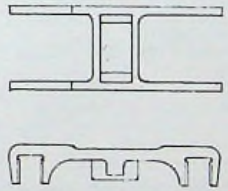


MAIN FRAME
4-8-2
CAST BR
NO. 501



STEAM DOME COVER
CAST BR. 1 REQ.
NO. 530

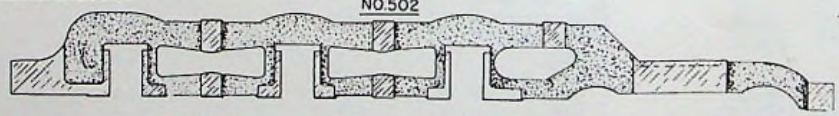
LEADING TRUCK FRAME
CAST BR.
NO. 515 1-REQ



LEADING TRUCK JOURNAL BOX
CAST BR.
2-REQ NO. 521

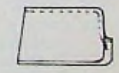
NOTE;
FINISH NECESSARY ONLY ON LINE SHADED AREAS, TOP & BOTTOM PADS, BOTH SIDES & DRIVE BOX PEDESTALS

MAIN FRAME
4-6-2
NO. 502



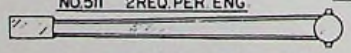
NOTE,
DRAWINGS OF ITEMS SHOWN HEREON HAVE BEEN REDUCED TO APPROXIMATLY ONE QUARTER OF FULL SIZE.

FOUNTAIN HOUSING
CAST BR. NO. 531

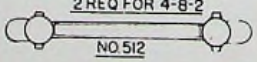


RODS
CAST BR.

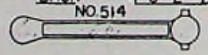
MAIN
NO. 511 2 REQ. PER ENG.



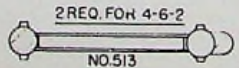
INTERMEDIATE
2 REQ FOR 4-8-2
NO. 512



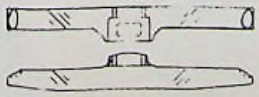
NO. 512 F.&B. FOR 4-8-2 4 REQ
BACK " 4-6-2 2 "
NO. 514



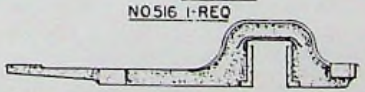
2 REQ. FOR 4-6-2
NO. 513



PILOT BEAM
CAST BR 1 REQ.
NO. 522

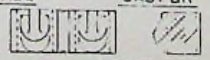


TRAILING TRUCK FRAME
CAST BR
NO. 516 1-REQ



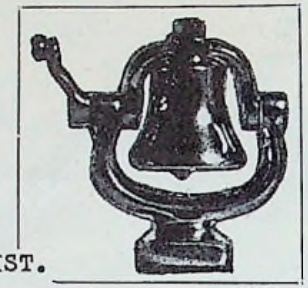
STACK
1 REQ CAST BR NO. 532

TRAILING TRUCK JOURNAL BOX.
2-REQ CAST BR



NO. 523

LOCOMOTIVE BELL CASTINGS

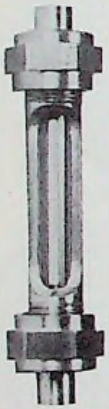


SEE ENGINE BELL GROUP on 3/4" SCALE CASTING LIST.

¾" or 1" scale with prints..... $2.75
1½" scale with prints..... 3.40

With these castings you can make up a bell assembly like the one shown full size in the illustration. The castings were made from authentic drawings of full size locomotive bell assembly and are complete and in correct proportion.

WATER GAUGE



This water gauge is suitable for 1", 3/4" and 1/2" scale locomotives. It is excellently constructed, and is rugged and made easy to read. The glass is 3/16" O.D. and is well protected in its brass cut out tube case. The latter has a window at the rear which admits light from the back and makes for easy reading. The packing nuts on each end draw down sleeves which in turn force the neoprene packing washers against shoulders in the ends of the tube case, bringing the washers into a steam proof seal against the glass tube. The sleeves are threaded 10-32 making easy connection to the boiler back head and gives ample circulation for accurate reading. These gauges have given excellent service.

Price complete, ready to install..$4.85
(Photo approx. actual size)

GLASS TUBING FOR WATER GAUGES

5/32" dia. Two 6" lengths..... .30
3/16" " " " " ..... .30
1/4" " " " " ..... .35
1/2" " 1 " " ..... .25

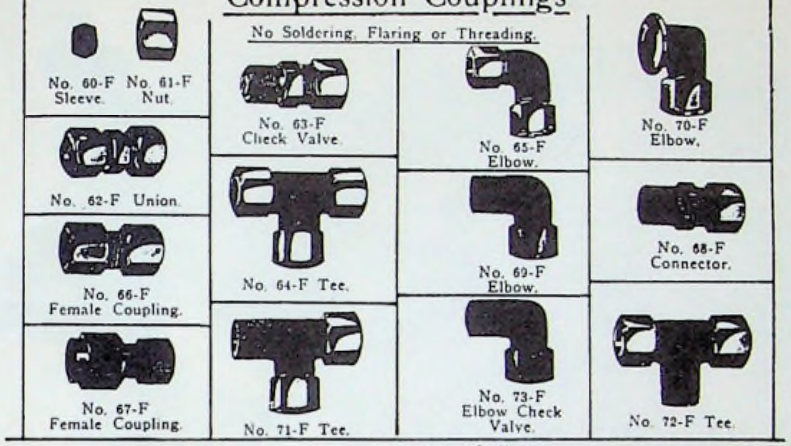
PLASTIC GASKET CEMENT

Permatex No. 2

A slow-drying non-hardening compound to be used on cylinder head, valve chamber, head gaskets, also on cock, valve, and pipe threads. Full directions on each tube. 1 oz. tube, postpaid..... .40c

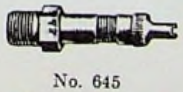
Compression Couplings

No Soldering, Flaring or Threading.

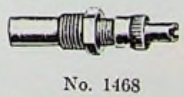


No.	Article	O. D. of Tube 1/8"	3/16"	1/4"	5/16"	3/8"	1/2"
60F	Sleeve	$0.20	$0.20	$0.20	$0.20	$0.20	$0.25
61F	Nut	.20	.20	.20	.20	.25	.35
62F	Union	.40	.40	.40	.45	.50	1.25
63F	Check Valve	50.	.50	.60	.60	.60	1.15
64F	Tee	.45	.45	.50	.60	.65	1.65
65F	Elbow	.40	.40	.40	.45	.50	1.35
66F	Coupling	.35	.35	.35	.35	.40	....
67F	Coupling	.40	.45	.45	.55	.60	....
68F	Connector	.30	.30	.35	.35	.45	.80
69F	Elbow	.35	.35	.35	.35	.45	1.00
70F	Elbow	.35	.35	.35	.35	.55	1.10
71F	Tee	.45	.45	.45	.50	.55	1.50
72F	Tee	.45	.45	.50	.65	.65	1.50
73F	Ell Check Valve	.60	.60	.60	.85	.90	....

SCHRADER INDUSTRIAL TANK VALVES



No. 645



No. 1468

For tanks, compressors and pneumatic devices where an automatic valve attached with threads is desirable. Permits inflation, deflation and pressure testing similar to tire valve treatment.

No. 645. ⅛ inch tapered iron pipe thread at bottom permits valve to protrude maximum length .....each $0.60

No. 1468. ⅛ inch tapered iron pipe thread part way up stem allows minimum protrusion of valve.....each $0.60

Note: These valves are available with cores and caps of different types for various special purposes.—oil resisting seats, special spring tension, heat and other conditions can be accommodated upon request

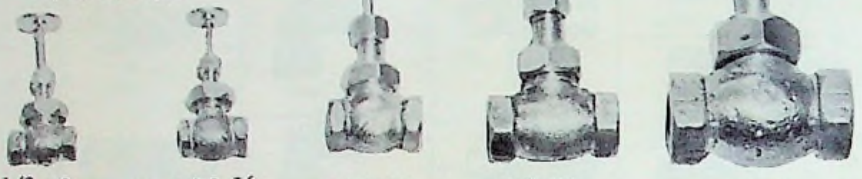
GLOBE VALVES

ACTUAL SIZE.

Operating pressure 125 pounds water or steam

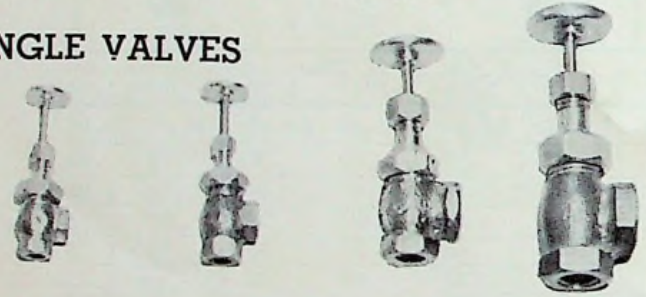
Globe
Fig. No. 1620

1/8-40	1.35
5/32-36	1.35
3/16-32	1.50
1/4-32	1.60
5/16-27	1.75



1/8-40 5/32-36 3/16-32 1/4-32 5/16-27

ANGLE VALVES



Angle
Fig. No. 1625

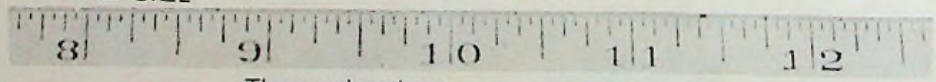
1/8-40	1.35
5/32-36	1.35
3/16-32	1.50
1/4-32	1.60
5/16-27	1.75

UNIONS

Fig. 2344
Union

1/8-40	45¢
5/32-36	45¢
3/16-32	50¢
1/4-32	55¢
5/16-27	65¢

ACTUAL SIZE



These valves have

Tobin bronze stems.

We reserve the right to fill orders with bodies made of square brass sto

These miniature valves and pipe fittings are threaded as follows: 1/8"-40 (5-40), 5/32"-36, 3/16"-32, 1/4"-32 and 5/16"-27. The "pipe" to be used is hard drawn brass or copper seamless tubing. When threading the tubing, just turn the die on the stock to the depth of the die, this will make a snug fit. Use Permatex #2 on all male threads. When connecting either globe, angle or check valves, always connect the pressure side so that the pressure is under the valve, otherwise you will have leaks. Graphited yarn oiled is to be used for valve stem packing, or you can unravel standard valve stem packing and use a strand of that in the packnut. (As stated above, 5-40 and 1/8"-40 are the same size.)

BRASS

VALVES

Horizontal Check
Fig. No. 1624

1/8-40	1.15
5/32-36	1.15
3/16-32	1.25
1/4-32	1.35
5/16-27	1.40

ANGLE CHECK

1/8-40	1.15
5/32-36	1.15
3/16-32	1.25
1/4-32	1.35
5/16-27	1.40

Fig. 2342S
Street Elbow

1/8-40	50¢
5/32-36	65¢
3/16-32	70¢
1/4-32	85¢
5/16-27	85¢

Fig. 2342
Tee

Tees and street elbows, same price and sizes.

Reducer
Fig. 3758

BUSHING

Plugs

Caps.

PIPE COUPLING

Fig. 2341
Elbow

1/8-40	50¢
5/32-36	55¢
3/16-32	65¢
1/4-32	70¢
5/16-27	85¢

Reducers and Bushings same in price

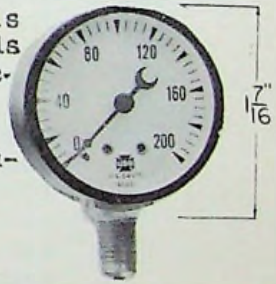
1/8 to 5/32	30¢
5/32 3/16	35¢
3/16 1/4	35¢
1/4 5/16	40¢
5/16 3/8	50¢

1/8-40	25¢	
5/32-36	30¢	
3/16-32	35¢	
1/4-32	35¢	
5/16-27	40¢	

1/8-40	20¢	
5/32-36	25¢	
3/16-32	25¢	
1/4-32	25¢	
5/16-27	25¢	

1/8-40	20¢	
5/32-36	25¢	
3/16-32	30¢	
1/4-32	35¢	
5/16-27	35¢	

U. S. PRESSURE GAUGE

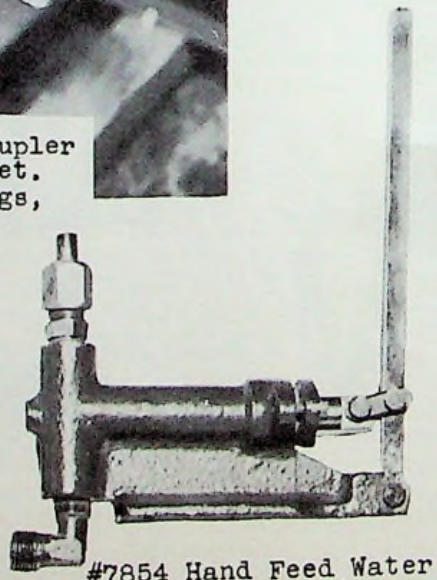


#200. Note that this pressure gauge is calibrated over 270 degrees, and reads 0-200 lb. We have these made up special and it is the smallest size O.D. that we can have made and guarantee accurate reading--it is far more accurate than the smaller imported gauges. In fact it is an accurate indicator of pressure and can be relied upon. A 3/16" SAE tubing nut is furnished, which makes for neat application....Price each with SAE nut... $3.50

3/4" SCALE CASTINGS
(see pages 7 & 8)

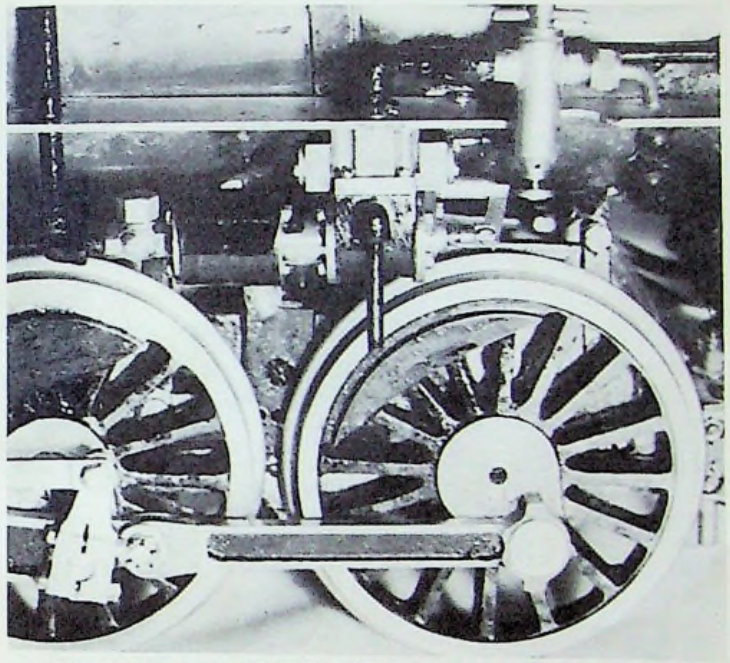
#788A Drive wheel, shown finished.

Application of Coupler and Draw bar Pocket. 3/4" scale castings, #7850 and #786.

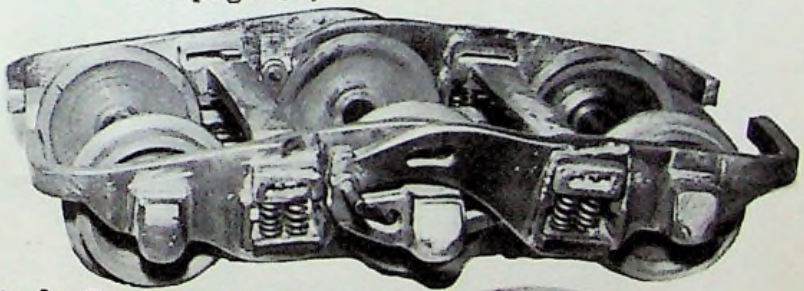


#7854 Hand Feed Water Pump shown finished (see page 8)

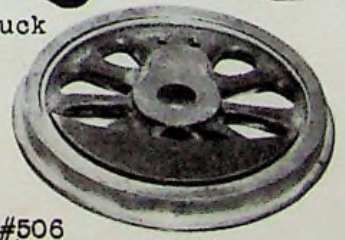
1/2" SCALE CASTINGS



Steam Driven Feed Water Pump #3 as applied to our 1/2" scale locomotive see page 27)

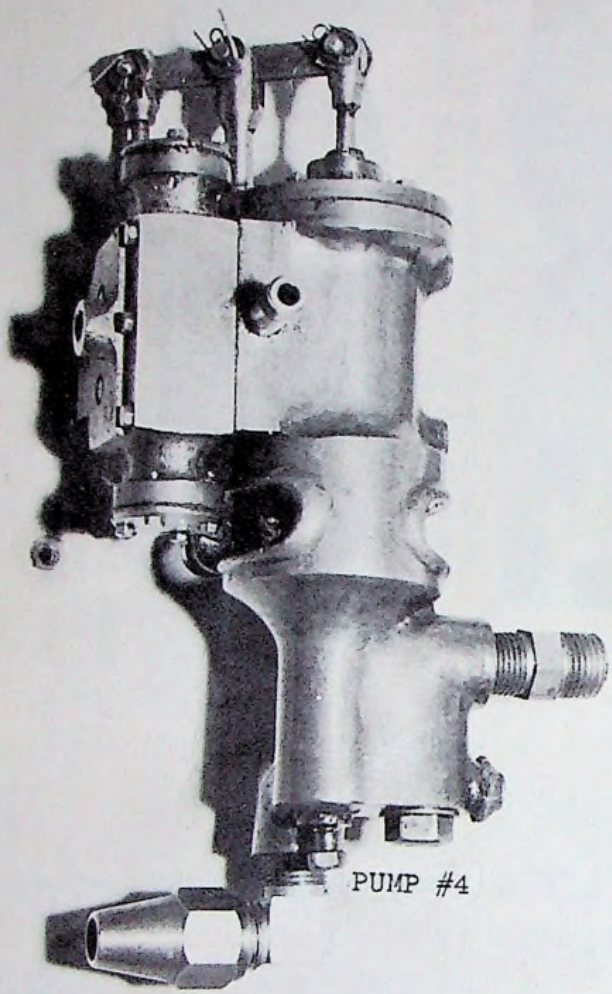


1/2" Scale Buckeye Tender Truck in the course of construction (see page 21)

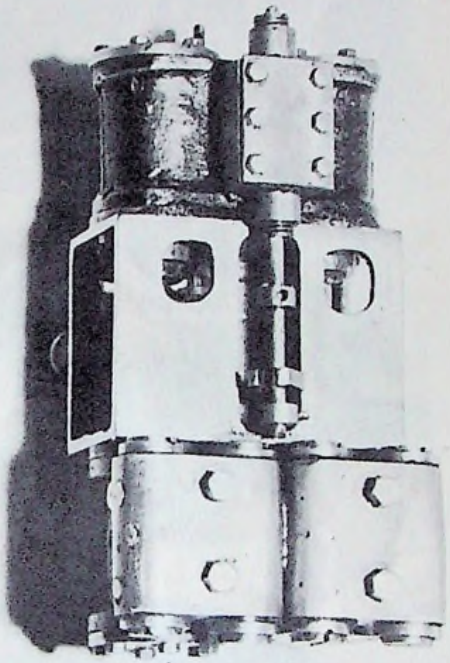


Disc poo driver, #506 shown finished (see page 21)

STEAM DRIVEN FEED WATER PUMPS
(see page 27)



PUMP #4

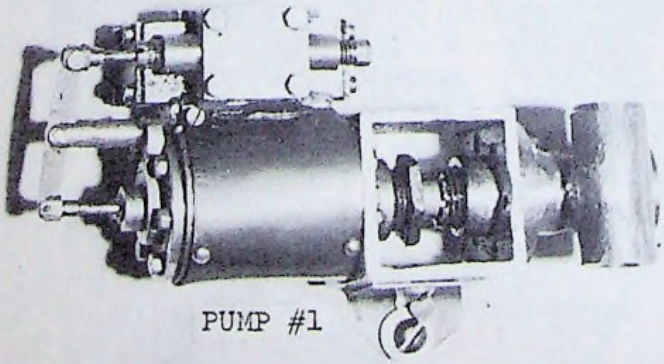


PUMP #2

SAFETY VALVE

("Pop" Type)

See page 27



PUMP #1

POP SAFETY VALVES

Our materials, with drawings and written matter will enable you to build a pop valve that is in keeping with standard practice. These safety valves open with a "pop" for quick release and close with a sharp cut off due to the extra area over lapping the valve seat. They are realistic in appearance and performance. Drawings and Instructions, with all materials for building one pop valve, for 1/4", 1/2",or 3/4" scale (specify which scale).. $1.50

******* See picture on page 26

LUBRICATOR

The lubricators for which we can supply raw materials are of the hydrostatic type, and are suitable for lubricating the steam cylinders and valves for locomotives and air and water pump steam cylinders. Prings, materials and instructions cover the subject thoroughly. These lubricators are intended to be connected to steam lines as close to the steam chest as possible and work on the hydrostatic principle. That is, when the engine is running under steam, some of the steam enters the lubricator through the oil pipe and condences in the lubricator, and the resultant water drops to the bottom of the lubricator and displaces the oil at the top, forcing it to flow into the cylinder, or steam chest, through the same pipe that is used to admit steam to the lubricator. These lubricators are used only with non-superheated steam. Drawings and instructions and all parts for the construction of one lubricator, for 1/2" or 3/4" scale locomotive (specify scale size of engine when ordering)..... $1.50

See other lubricator on page 38

INJECTOR

The prints, canstings and instructions for making these are available, and are according to the British type that have proved so satisfactory in model work. Good workmanship is essential to success, but when once rightly made and operating, they are a fine means of getting water into a boiler. The feed water being preheated in the injector as the steam supply to the injector strikes the feed water and condenses giving up some of its heat and all of its velocity to force the water into the boiler. There are no moving parts in the injector, and they are a most interesting little device to make being based on scientific principles. See line drawing on page 13 casting Number 7849. Drawings and instructions with castings and parts for one Injector for 1/2" or 3/4" scale locomotive (specify scale size of engine when ordering)..... $3.00

****

WATER GAUGE

A dependable visible means of knowing where the water level is in the boiler is a most essential accessory to any boiler. Our pannel glass type has a cast bronze body, blow out cock and upper and lower shut off cocks to enable one to replace the glass while the boiler is under steam pressure. The macnining operations are simple and fully covered by the prints and text matter in a manner easily understood. The shape of the gauge is in keeping with full size practice and presents a fine appearance among the other boiler fittings in the cab. This gauge is suitable for 3/4" and 1" gauge engines. See line drawing on Page 13, casting Number WG78. Castings, screws, glass, with Drawings and Instructions..... $3.00

****

HAND PUMP

This is a handy little pump, always useful for testing boilers hydrostaticly and it is a good hand feed water pump for small boilers. It is also useful in an emergency, as for instance in case of failure of the injector or main pump, the hand pump will enable one to keep the engine running while making repairs. The machine work can be done on a 5" lathe, or they can even be finished on the drill press with a little hand work. All castings and parts with Drawings and instructions..... $3.50
(For 3/4" and 1/2" engines, See line drawing on Page 13 ,Casting #7854

See picture on page 25

STEAM DRIVEN FEED WATER PUMPS
FOR SUPPLYING FEED WATER TO ALL TYPES OF MINIATURE BOILERS
By: Martin S. Lewis

* PUMP #1 This pump is for 3/4" scale engines with cylinder bores under 1-3/8" and for 1/2" scale engines having cylinders up to 1" in diameter. The bore of steam cylinder of this pump is 1/2" in diameter with a 5/8" stroke and the single acting pump piston is 1/4" in diameter and the maximum number of strokes is 200 per minute and at this rate the output is .229 cubic inches of water per minute or a little under 1/4" pint of water. The pump assembly can be mounted either in vertical or horizontal position by setting the check valve to work in a vertical position. The exterior overall length of the pump is 4-1/4" and the width is 1-1/8". Price of castings, and all materials for this pump with thorough and complete drawings and written instructions. $10.00

* PUMP #2 This pump is for 3/4" scale engines and is a two cylinder steam driven pump with two double acting water pistons. The steam cylinder bores are 1/2" with stroke of 5/8" and the water pistons are 3/8" bore by 5/8" stroke. Valve gear is through pilot valve and main valve. This pump is intended for operation in a vertical position only and at 200 strokes per minute (maximum). The out put is 1-3/4" pints per minute, or per 200 strokes. Price of castings and all materials for this pump with thorough and complete drawings and written instructions.....$10.00

** PUMP #3 This pump is for 1/2" scale and can be used on O-gauge steamers. It is a horizontal type and can be located under the running board or on the front end door. By turning the check valves in the pump to work vertically, the pump assembly may be installed in a vertical position. The valve action is through pilot controlled main valve. The bore of the steam cylinder is 3/8" in diameter and the stroke 3/8"; the water piston is 3/16" in diameter with a 3/8" stroke. Overall dimensions are 3-1/4" long and 1-1/8" wide. Price of castings and all materials for this pump with thorough and complete drawings and written instructions..... $9.00

* PUMP #4 This is a single cylinder pump having a steam cylinder bore of 3/4" and a stroke of 3/4" with a single acting water piston 3/8" in diameter and a 3/4" stroke and will supply water to locomotives of 3/4" and 1" scale engines having cylinder bores up to 1-7/8". This pump is for mounting in an upright position only. The steam passages are cored from steam ports to ends of the cylinder and main valve is actuated by a pilot valve. The overall length of this pump assembly is 5-1/2" and the width is 2-1/2". The price of this pump may seem high, but this is because of the work involved in moulding, due to the coring work on the steam ports. Price of castings and all materials for this pump with thorough and complete drawings and written instructions..... $10.00

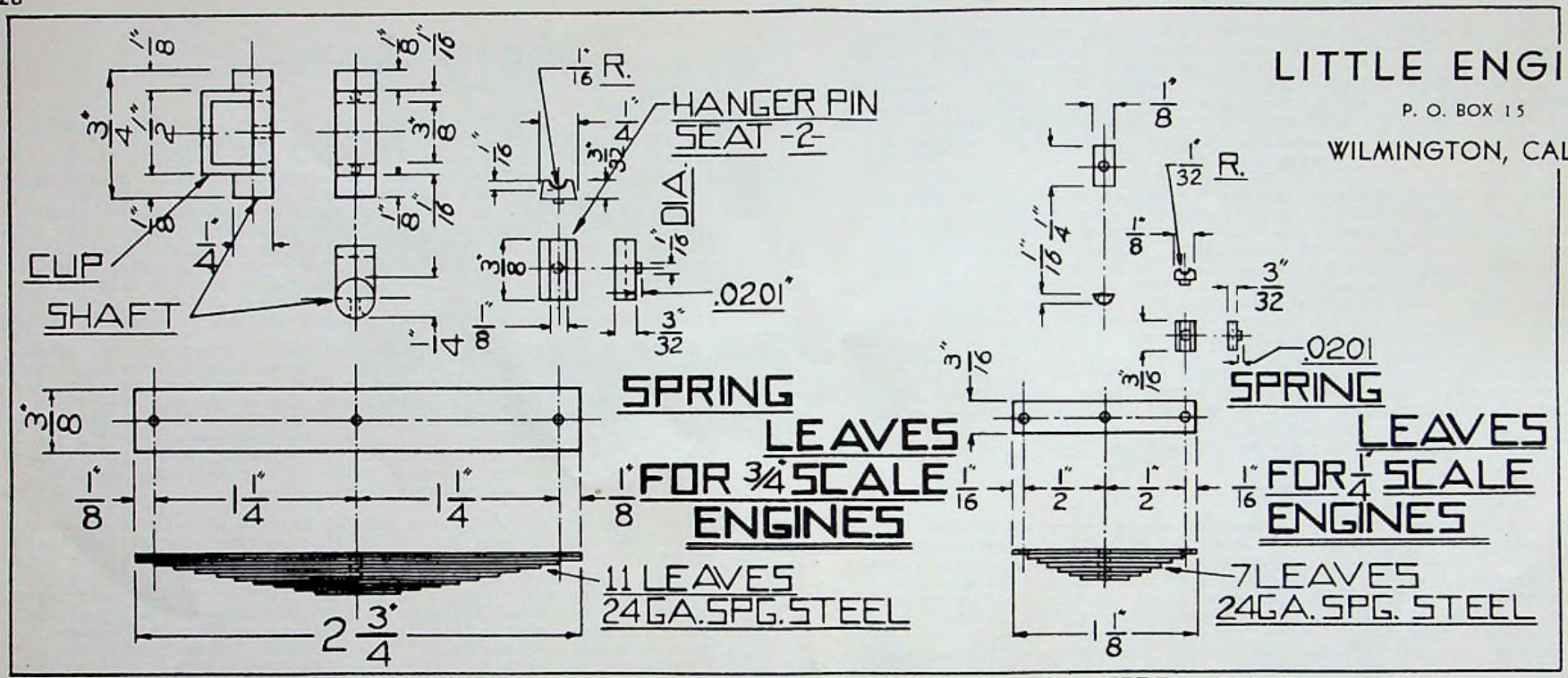
A BOOK FULLY ILLUSTRATED, containing the drawings and instructions for these four steam driven feed water pumps, by Martin S. Lewis...$3.00

(See Order Blank on last pages)

*See picture on page 26

*See picture on pump in application on page 25

WATER GAUGE for 1/4" and 1/2" scale. We can furnish parts with drawings and instructions for making a fine water gauge, panel type, easy to read, and easily made...Drawings,Instructions,&Parts..$1.50



SPRING LEAVES
For 3/4" Scale Steam Locomotives

All holes are precision punched so that leaves will lineup. Main(top leaf) punched three holes 1/16" dia. Other 10 leaves punched 1/16" dia. holes for 1/16" dia. rivet for holding 11-leaf assembly to trunion shaft and clip.

11 leaves furnished, cut to lengths. Two upper leaves 2 3/4" overall & remaining 9 leaves are graduated in lengths from 2½" to ½" long by eighths of an inch. Purchaser is to make up the clips and hanger seats and assumble springs. (Sizes are given in above illustration.)

SOLD ONLY IN UNASSEMBLED SETS OF LEAVES:

11 leaves for 1 spring..... $ .40
6 sets of leaves for 6 springs(66 leaves) 2.40
8 " " " " 8 " (88 leaves). 3.20

For leaf truck springs for 3/4" scale trucks see "0" gauge springs.

SPRING LEAVES
For 1/4" Scale Steam Locomotives

All holes precision punched so that leaves will lineup. Main(top leaf) is punched three holes 1/16" dia. The other six leaves are punched with 1/16" dia. hole in the center of each leaf for 1/16" dia. rivet to hold the spring leaf assembly to the trunion shaft.

7 leaves furnished, cut to exact lengths. The main leaf is 1 1/8" long and the remaining six leaves are graduated in lengths from 15/16" down to 5/16" long by eights of an inch. Purchaser is to make trunion shaft and assemble the springs. (Sizes are given in above illustration.

SOLD ONLY IN UNASSEMBLED SETS OF LEAVES

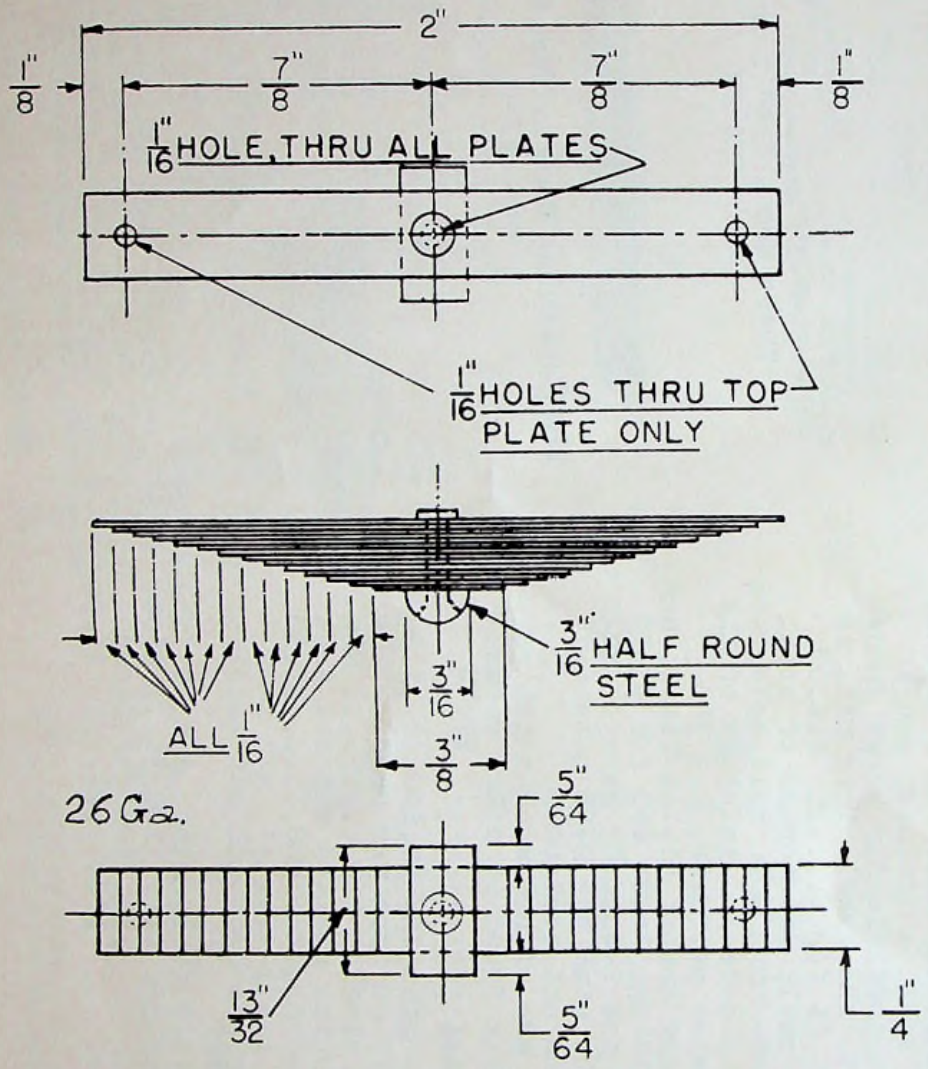
7 leaves for one spring..... $ .25
6 sets of leaves for 6 springs(42 leaves) 1.50
8 " " " " 8 " (56 leaves). 2.00

These little springs make fine leaf springs for larger scale tender truck trailer and leading truck leaf springs.

DRIVING SPRINGS

6 REQ FOR CL. 4-6-4
8 " " " 4-8-4

1/2" SCALE



DRIVE springs play an important part in the makeup of the locomotive by absorbing rod shocks and preventing crystallization of parts, which would ordinarily take place if the engine was allowed to bump along without springs. From the first locomotive to the latest there has been a steady improvement in spring rigging and spring steel.

The position of the driver springs and equalizer levers is sometimes reversed—that is, the springs may be located in openings in the frames and the equalizer levers placed above the frame. This arrangement is a great space saver and is in common use on the Mallet articulated locomotives, but many other types of locomotives have one or more pairs of springs arranged in this way where it is necessary for structural convenience.

In the engine under our present consideration we shall arrange the springs above the frames, and put the equalizer levers in openings in the main frames, and we might as well get busy making the drive springs.

DRIVE SPRINGS

These are six in number for our 4-6-4 and eight will be required for the 4-8-4 class. Each spring is composed of fourteen leaves or plates of spring steel, No. 26 gauge by 1/4" wide, and varying in length from 2" for the main, or *top plate*, to 3/8" for the *bottom plate*. In other words, each plate from top to bottom is 1/8" shorter, as will be noted from the table of plate lengths as shown below:

No. 1	top or main plate.....	2"
2	plate	1 7/8"
3	plate	1 3/4"
4	plate	1 5/8"
5	plate	1 1/2"
6	plate	1 3/8"
7	plate	1 1/4"
8	plate	1 1/8"
9	plate	1"
10	plate	7/8"
11	plate	3/4"
12	plate	5/8"
13	plate	1/2"
14	plate	3/8"

The top plate will be seen to have three 1/8" dia. holes, one near each end to lock the spring hanger saddles in place, and one hole 1/8" diameter in the center for the spring center-pin. This pin can be made of a 1/8" diameter steel or brass rivet, either flat or round head. The purpose of the spring center-pin is to hold the plates together on the spring trunnion. The trunnion is of 3/8" half round steel. You can use pieces of 3/8" spring cotter-pins, cut to the length shown for the trunnions.

These SPRINGS CAN BE USED not only on the drive boxes of the 1/2" scale but they are specified for the leading truck and trailing truck. Any number of leaves can be assembled to suit the particular application and the spring action desired, according to the weight to be carried.

Where spring leaves are indicated on tender trucks for 3/4" scale these springs can be used in full size. The same applies to the leading and trailer trucks of 3/4" scale engines. They can also be used on car trucks of the non passenger hauling cars of both 1/2" and 3/4" scale where leaf spring trucks are to be used.

SOLD ONLY IN UNASSEMBLED SETS OF LEAVES, 14 leaves per spring...
Each leaf precison cut and punched, price per set of leaves..... 35¢

RAIL
AND FASTENINGS FOR 3/4", 1/2" and 1/4" SCALES

Our rail for 3/4", 1/2" & 1/4" (O-gauge) is in all three scales of "Duralumin" (ALCO Spec. Alloy 61S-T) and is a corrosion resistant alloy having the tensil strength of steel. It is a hard, servicable rail due to the qualities of the alloy and to the forming process. The quantity is unlimited, and you will be pleased with the fine appearance and durability of this fine rail, which will set off your motive power and rolling stock to the best advantage. The prices are as follows:

RAIL, 3/4" scale (this rail is suitable for 1" scale) comes in 5 ft. lengths for small shipments, and in 10 ft lengths for shipments sufficiently large enough to send by freight (1000 ft. and over). This rail is 15¢ per ft., or 100 ft for $15.00

RAIL JOINTS, for 3/4" scale rail, die formed of steel and plated to make them rust-resistant bolt holes are punched, and they are a duplicate in miniature of the regulation rail joint... price per pair..... 10¢.

SPIKES, for 3/4" scale. These are of plated steel, and are over size to insure holding. Price 450 for $1.00

(Bolts for the above rail are 2-56x3/8" hexagon head and will be found together with the 2-56 nuts and #2 washers in our bolt and nut section)

TIES for 3/4" scale, these are of red wood which resists the rot that is usually found in other woods. The price per 100 is..... $1.75

RAIL 1/2" Scale, in 4 ft lengths, 12¢ ft, 100 ft..$12.00

RAIL JOINTS, 1/2" scale bolt on type per pair... 10¢

SPIKES, 1/2" scale, plated steel, 500..... 90¢

TIES 1/2" scale, red wood which resists the rot that is usually found in other woods..per 100..... $1.50

(The bolts for this rail are 1-72x1/4", and 1-72 nuts,& will be found in the bolt and nut Section)

RAIL 1/4" (O-gauge) scale in 5 ft lengths, and is fine for electric trains too. 5½¢ per ft. 100 ft... $5.50

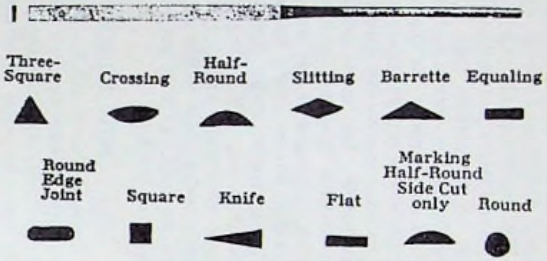
RAIL JOINTS, 1/4" scale slip on type, 40¢ per dozen.

SPIKES for 1/4" scale, steel ... 1000..... $1.00

For 25c (coin) we shall send postpaid a generous sample of this rail and a pair of rail joints together with sample spikes. In this way the fine quality of the rail and fastenings can be appreciated.

AMERICAN SWISS NEEDLE FILES

KNURLED HANDLES



Note.—Lengths given are overall (including knurled shank)
Following shapes, lengths and cuts carried in stock

Shapes	
Round	Knife
Half-round	Flat
Three-square	Square
Crossing	Barrette
	Equalling

Sets of 12 assorted. All shapes, dozen... $6.00

These are 4 3/4" long.

ONE DOZEN IN A BOX,

Flat Hard Drawn Brass and Mild Steel Rods

Prices Per Foot

hickness Inch	Metal	Inches Width ¼	⅜	½	¾	1	2	3
1/32	Brass	$.07	$.15	$.14	$.19	$.26	$.39	$
1/16	Brass	.10	.18	.19	.29	.37	.58	.87
3/32	Brass	.11	.20	.26	.39	.51	.85	1.28
1/8	Brass	.14	.25	.46	.52	.64	1.27	1.90
3/16	Brass	.20	.31	.50	.59	.79	1.57	2.37
1/4	Brass	.21	.35	.70	.75	1.00	1.99	2.75
5/16	Brass	....	.38	.70	.93	1.24	2.47	....
3/8	Brass	....	.44	.85	1.10	1.40	2.75	3.71
1/16	Steel	.08	.08	.09	.10	.15	.20	.25
3/32	Steel	.10	.10	.12	.17	.21	.23	.35
⅛	Steel	.10	.11	.14	.17	.23	.32	.47
3/16	Steel	.10	.11	.18	.20	.26	.45	.68
¼	Steel	.10	.14	.19	.26	.39	.61	.89
5/16	Steel	.12	.23	.29	.39	.51	.85	1.37
⅜	Steel	.12	.17	.31	.42	.60	1.20	1.67

The 1/32" Brass is known as Hoop or Ribbon Brass and comes in coils.

1/16" and 3/32" Brass and Steel have sheared edges except two or three sizes eel have rounded edges. Larger sizes, 1/8" thickness and up., have square edges. e can also supply intermediate widths. When ordering allow price of next size rger and if possible, permission to supply the nearest stock size to your requirements.

Other sizes furnished on request

RIBBON STEEL

Tempered Clock-Spring Steel

Used for multiple-leaf locomotive drive box and truck springs. Prices are per foot

Thickness B. & S. Gauge	Dec.	Widths ⅛"	3/16"	¼"	5/16"	⅜"	½"	⅝"
30	.010		.05	.07	.10	.12	.12	.14
26	.015		.05	.07	.10	.12	.12	.14
24	.020		.05	.07	.10	.12	.12	.14

ROUND SHELBY

SEAMLESS STEEL TUBING

Shelby steel tubing comes in many diameters, and although not shown on this list practically any size can be furnished, and prices will be quoted upon request. Cutting charges, less than 13" add 25% to price. 13" and over add 10% to price.

Outside Diameter	Wall Thickness Gauge	Price per Foot	Outside Diameter	Wall Thickness Gauge	Price per Foot
⅛"	22		¾"	22	
3/16"	22			18	
5/16"	22			16	
	18		1"	22	
	16			18	
¼"	22			16	
	18		1½"	16	
	16			11	Prices quoted on request
5/16"	22	Prices quoted on request	2"	16	
	18			11	
	16		3"	16	
⅜"	22			11	
	18		3½"	16	
	16			11	
½"	22		4"	16	
	18			11	
	16		5"	16	
⅝"	22			11	
	18		5½"	11	
	16		6"	11	

SHEET METAL

In foot width strips—priced per square foot.

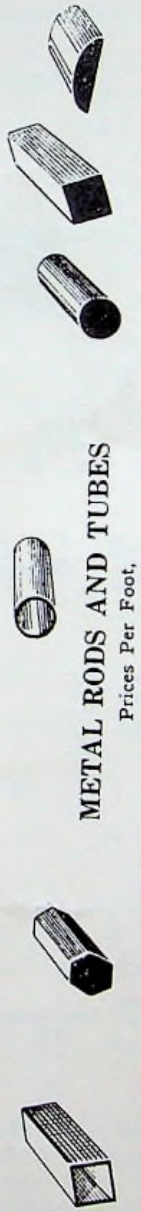
No. 40

B. & S. Gauge	No. 26	No. 20	No. 16	No. 14	No. 12	No. 10	⅛"
Dec. Inch	.01594	.03196	.05082	.06408	.08081	.10189	.125
Near fractions inch	1/64"	1/32"	3/64"	1/16"	3/32"	3/32"+	⅛"
Sheet Brass	1.20	1.95	2.50	3.10	3.10	4.70	Prices quoted on request
Sheet Copper	1.55	2.30	3.15	3.40	3.45	4.75	
Sheet Aluminum	.75	1.10	1.20	1.40	1.65	2.10	
Sheet Duralmin	.93	1.40	1.50	.....	.....	.....	.....

SHEET STEEL, COLD ROLLED

Stubbs Gauge	No. 26	No. 20	No. 16	No. 14	No. 12	No. 10	⅛"
	.018	.035	.065	.083	.109	.134	.125
Price per sq. ft.	.92	1.25	1.45	1.82	2.40	3.05	3.25

Other sizes furnished on request



METAL RODS AND TUBES

Prices Per Foot,

Diameters, fractions of inch	1/16	3/32	1/8	5/32	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
Round Brass Rods	$ .05	$ .05	$ .07	$ .10	$ .17	$ .25	$ .35	$ .60	.72	$1.20	$1.75	$2.30
Half Round Brass Rods	.05	.05	.06	.10	.10	.15	.17	.25	.38			
Square Brass Rods	.05	.07	.10	.12	.14	.21	.32	.41	.78			
Hexagon Brass Rods		.09	.09	.12	.20	.36	.45	.76	.83	1.20	1.75	2.20
Round Cold Finished Steel Rods			.05		.09	.15	.15	.20	.23	.34	.82	1.18
Square Cold Finished Steel Rods			.05	.12	.12	.14	.14	.18	.29	.58	1.10	1.67
Hexagon Cold Finished Steel Rods		.08	.08	.08	.12	.15	.18	.18	.24			
Round Bessemer Steel Rods	.05	.05	.05	.05	.07	.10	.25	.14	.24	.78		
Round Steel Drill Rod—Polished	.08	.10	.14	.14	.16	.18	.31	.50	.66	1.14		
Square Steel Drill Rod	.10	.15	.19	.23	.26	.31	.48	.86	.93			
Round Stainless Steel—Ground and Polished	.30	.30	.28	.29	.30	.32	.40	.50	.71	.98		
Round Nickel Steel—Annealed									.72	.87	.90	1.35
Round Tobin Bronze Rod			.10		.16	.21	.32	.50	.61	.90	1.20	2.15
Round Phosphor Bronze Rod			.12		.24	.32	.56	.90	1.05	1.70	2.10	3.35
Round Nickel Silver Rod			.17	.24	.31	.40	.65	.90				
Round Aluminum Rod			.06	.08	.10	.12	.19	.33	.35			
Round Duralumin Rod	.07	.08	.11	.12	.15	.17	.19	.20	.37			
Round Copper Tube—Stubs Ga. 22 (.028") O.D.		.14	.20	.20	.20	.25	.25	.25	.26			
Round Copper Tube—Stubs Ga. 20 (.035") O.D.			.15	.20	.25	.25	.25	.25	.30	.44	.71	$1.07
Round Copper Tube—Stubs Ga. 18 (.049") O.D.					.20	.25	.26	.28	.35		.75	1.09
Round Copper Tube—Stubs Ga. 16 (.065") O.D.								.32	.43		.83	1.10
Round Brass Tube — Stubs Ga. 28 (.014") O.D.	.10	.11	.12	.14	.15	.16	.18	.22				
Round Brass Tube — Stubs Ga. 24 (.022") O.D.			.10	.14	.18	.23						
Round Brass Tube — Stubs Ga. 22 (.028") O.D.	.15		.20	.20	.20	.21	.21	.24	.26			
Round Brass Tube — Stubs Ga. 20 (.035") O.D.			.17	.20	.20	.20	.25	.27	.27			
Round Brass Tube—Stubs Ga. 19 (.042") O.D.			.11		.14	.17	.25	.25				
Round Brass Tube—Stubs Ga. 16 (.065") O.D.									.30	.53	.68	.86
Square Brass Tube—B. & S. Ga. 19 (.035") O.D.						.21	.29	.34	.46			
Round Aluminum Tube, Stubs Ga. 20 (.035") O.D.		.11	.12		.12	.27	.37	.39	.42			
						.12	.16	.18	.18	.21	.29	.30

Other sizes furnished on request

LOCK WASHERS

Screw Size	Width	Thickness	Per Dozen
2	1/32	1/32	$ .15
4	1/32	1/32	.15
6	1/16	1/32	.15
8	1/16	3/64	.10
10	3/32	1/16	.11
12	3/32	1/16	.12

CHANNELS

No. 41

Thickness	Width	Steel Price	Brass Price
1/16	1/4	.30	.40
1/16	3/8	.35	.50
1/16	1/2	.40	.60

ANGLES

No. 42

Thickness	Width	Steel Price	Brass Price
1/16	3/16 x 3/8	.35	.45
1/16	1/4 x 1/2	.45	.55

Structural Tees

35¢ per foot

Bar Sizes

Width Flange In.	Size Stem In.	Thick. Web In.	Wt., Lbs. per Foot
3/4	3/4	1/8	.61
1	1	1/8	.81

Structural Angles

35¢ per ft.

Bar Sizes

Size Inches	Wt. Lbs. per Foot
1/2 x 1/2 x 3/32	.29
3/4 x 3/4 x 1/8	.59
1 x1 x 1/8	.80

Standard Channels

Bar Sizes

35¢ per ft.

Depth In.	Width Flange In.	Thick. Web In.
3/4	3/8	1/8
3/4	3/8	#15
7/8	7/16	1/8
1	3/8	1/8
1	1/2	1/8

SHAKE PROOF LOCK WASHERS

No. 31

Machine Screw Sizes.

Screw Size	Hole Diameter	Outside Diameter	Thickness	Price Per Doz.
4 or 5	.118	.275	.018	$0.10
6 (1/8")	.145	.313	.018	.10
8 (5/32")	.175	.375	.021	.10
10 (3/16")	.200	.390	.024	.10

Shakeproof is a light scientifically constructed lock washer, that effectively locks. Its holding quality is increased by vibration. Manufacturers now using this product claim that they are cutting production costs, due to the non-tangling feature of Shakeproof. There is also a considerable saving in bolt lengths.

When properly installed it eliminates the ever present trouble of bolts and screws coming loose. Its neatness adds to appearance—it does not upset the nut. It does not gouge into, distort or in any way mar the work, the thread or the nut. Shakeproof lock washers are rust proof.

WASHERS

Screw Size	Diameter Hole	STEEL or BRASS Outside Diameter	Thickness	Per Doz.	Per Gro.
0	.0635	1/8	.015	$ .15	$1.35
1	.0785	5/32	.020	.15	1.35
2	.089	3/16	.025	.15	1.35
3	.1015	3/32	.030	.20	1.80
4	.116	1/4	.035	.20	1.80
5	.1285	5/32	.040	.20	1.80
6	.1405	5/16	.045	.20	1.80
8	.170	11/32	.050	.25	2.75
10	.1935	3/8	.055	.25	2.75
12	.221	7/16	.060	.25	2.75

STARRETT GROUND FLAT STOCK TOOL STEEL

No. 495. Ground flat stock is a first quality tool steel cut to size and annealed. It is accurately ground by special process to one thousandth of an inch. It hardens at from 1425 to 1475 degree Fahr., according to shape of the material used.

Carbon content approximately 1.10 to 1.20%. It can be tempered in oil, brine, or water. Intricate work should be tempered.

This material is ready for use—you machine it to shape and harden if necessary—but you don't have to grind it to size. Made in nine different thicknesses and suitable for flat gauges, snap gauges, test tools, parallels, die work, machine parts, jigs, fixtures, shims, stamps and cutters. Using this stock will reduce many operating costs.

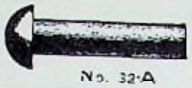
Thick. Inch	Size Inch	Each Piece
1/64	1 x18	$1.85
	1 1/2 x18	2.20
1/32	1 x18	1.25
	1 1/2 x18	1.50
	2 x18	3.05
	3 x18	4.10
	4 x18	4.10
	5 x18	5.50
	6 x18	8.00
3/64	1 x18	1.20
	1 1/2 x18	1.50
	4 x18	4.50
	5 x18	5.50
	6 x18	5.50
1/16	1 x18	1.35
	1 1/2 x18	1.50
	2 x18	2.05
	3 x18	2.75
	4 x18	3.50
	6 x18	6.50
3/32	1 x18	1.80
	1 1/2 x18	2.15
	2 x18	12.05
	3 x18	2.60
	4 x18	3.50

Thick. Inch	Size Inch	Each Piece
1/8	1 x18	$1.75
	1 1/2 x18	1.70
	2 x18	2.20
	3 x18	3.05
	4 x18	3.75
5/32	1 x18	4.50
	1 1/2 x18	2.15
	4 x18	5.50
3/16	1 x18	2.50
	1 1/2 x18	3.00
	2 x18	3.05
	3 x18	4.10
	4 x18	5.50
	5 x18	6.50
7/32	1 x18	2.30
	1 1/2 x18	2.75
1/4	1 x18	2.50
	1 1/2 x18	2.75
	2 x18	3.50
	3 x18	5.50
	4 x18	6.50
5/16	1 x18	2.60
	1 1/2 x18	3.05
	4 x18	8.00
3/8	1 x18	3.05
	1 1/2 x18	3.60

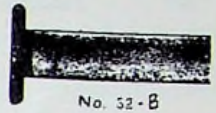
PISTON RINGS

These piston rings are of cast iron and they are suitable for steam engines, gas engines & locomotives.

Diameter	Width	Price Each
7/8"	X 3/32"	75¢
7/8"	X 1/8"	75¢
1"	X 3/32"	50¢
1"	X 1/8"	50¢
1 1/8"	X 3/32"	.45¢
1 1/8"	X 1/8"	.45¢
1 1/8"	X 1/16"	.45¢
1 1/4"	X 3/32"	.45¢
1 1/4"	X 1/8"	.45¢
1 3/8"	X 3/32"	.45¢
1 3/8"	X 1/8"	.45¢
1 3/8"	X 5/32"	.45¢
1 3/8"	X 3/16"	.45¢
1 1/2"	X 3/32"	.45¢
1 1/2"	X 1/8"	.45¢
1 1/2"	X 5/32"	.45¢
1 1/2"	X 3/16"	.45¢
1 5/8"	X 3/32"	.45¢
1 5/8"	X 1/8"	.45¢
1 3/4"	X 3/32"	.45¢
1 3/4"	X 1/8"	.45¢
1 3/4"	X 5/32"	.45¢
1 3/4"	X 3/16"	.45¢
1 13/16"	X 3/32"	.45¢
1 13/16"	X 1/8"	.45¢
1 13/16"	X 5/32"	.45¢
1 13/16"	X 3/16"	.45¢
1 7/8"	X 3/32"	.45¢
1 7/8"	X 1/8"	.45¢
1 7/8"	X 5/32"	.45¢
1 7/8"	X 3/16"	.45¢
2"	X 3/32"	.45¢
2"	X 1/8"	.45¢
2"	X 5/32"	.45¢
2"	X 3/16"	.45¢
2"	X 7/32"	.45¢
2"	X 1/4"	.45¢


No. 32-A

RIVETS


No. 32-B

COPPER, Round Head

Dia.	Dec.	Length	Price
1/16"	(.0265)	1/4", 5/16", 3/8", 1/2", ...	25¢ oz.
3/32"	(.0937)	3/16", 1/4", 3/8", 1/2", 5/8".....	20¢ "
1/8"	(.125)	1/4", 3/8", 1/2", 5/8", 3/4", 1"..	15¢ "

(1 oz of 1/16"x1/4" rivets contains 153 rivets)

COPPER, Flat Head

We have very little call for Flat Head rivets, but write us if you need them. The price is the same as the Round Head.

STEEL, Round head

Dia.	Dec.	Length	Price
1/16	(.0265)	1/4", 5/16", 1/2"	25¢ oz.
3/32"	(.0937)	1/4", 5/16", 1/2".....	20¢ oz.
1/8"	(.125)	5/8", 1/2", 3/4", 1".....	15¢ "

STEEL, Flat Head

1/8"	(.125)	1/2", 3/4".....	15¢ oz.

BRASS, Round head

Dia.	Dec.	Length	Price
1/16"	(.0625)	1/4", 1/2", 5/16".....	25¢ oz.
3/32"	(.0937)	3/16", 1/4", 3/8", 1/2".....	20¢ "
1/8"	(.125)	1/4", 3/8", 1/2", 5/8", 3/4", 1".	15¢ "

Note: If we have not listed the size rivet you want for your work, write us--we can probably get it for you.

HEADLESS SET SCREWS

(Cup Pointed, Hardened) STEEL

Screw Size	No. Threads Per Inch	Dia. Screw	Length of Screw	Price Per Doz.	Price Per Gross
0	80	.060	3/32, 1/8	.40	2.85
2	64 or 56	.086	3/32, 1/8, 3/16	.40	3.20
3	56 or 48	.099	1/8, 3/16, 1/4	.40	3.45

HEXAGON HEAD SCREWS

Steel screws are made from high-quality cold drawn hexagon screw stock. Brass screws are made from commercial rolled hexagon brass rod. All screws are milled from the bar, have cut threads and approximately the same head proportions as the Hexagon Head Cap Screws made to the National Screw Thread Commission standards.

Screw Size	No. Threads per Inch	Dia. of Screw	Diam. of Head*	Length of Head	Length of Screw	STEEL Price Per Doz.	STEEL Price Per Gro.	BRASS Price Per Doz.	BRASS Price Per Gro.
0	80	.060	3/32	.040	1/8	.22	2.30	.22	2.30
					3/16	.25	2.60	.25	2.60
					1/4	.28	2.90	.28	2.90
					5/16	.30	3.00	.30	3.00
					3/8	.35	3.50	.35	3.50
					1/2	.38	3.50	.40	4.00
					5/8 3/4	.45	4.50	.45	4.50
1	72	.073	7/64	.055	1/8	.25	2.50	.25	2.50
					3/16	.28	2.90	.28	2.90
					1/4	.30	3.10	.30	3.10
					3/8	.35	3.50	.30	3.30
					1/2	.38	3.80	.35	3.50
					5/8 3/4	.45	4.50	.45	4.50
2	56	.086	1/8	.064	1/8	.25	2.50	.28	2.80
					3/16	.28	2.80	.32	3.20
					3/8	.30	3.10	.35	3.50
					1/2	.35	3.50	.35	3.75
					5/8	.35	3.50	.38	3.80
					3/4	.40	4.00	.45	4.50
3	48	.099	5/32	.075	1/4	.28	2.80	.30	3.00
					3/8	.32	3.20	.35	3.50
					1/2	.35	3.50	.35	3.75
					5/8	.40	4.00	.40	4.00
					3/4	.40	4.00	.45	4.50
					1	.45	4.50	.50	5.00
4	40	.112	3/16	.084	1/4	.30	3.00	.32	3.20
					3/8	.35	3.50	.40	4.00
					1/2, 5/8	.40	4.00	.45	4.50
					3/4	.40	4.00	.45	4.50
					1	.40	4.00	.45	4.50
5	40	.125	7/64	.093	1/4	.30	3.00	.32	3.20
					3/8	.35	3.50	.35	3.50
					1/2, 5/8	.40	4.00	.40	4.00
					3/4	.45	4.50	.50	5.00
					7/8, 1	.45	4.50	.50	5.00
6	32	.138	7/32	.104	3/8	.35	3.50	.40	4.00
					1/2	.40	4.00	.38	3.80
					5/8	.40	4.00	.45	4.50
					3/4	.45	4.50	.50	5.00
					1	.50	5.00	.55	5.50
8	32	.164	1/4	.125	3/8	.40	4.00	.40	4.00
					1/2	.40	4.00	.45	4.50
					5/8	.45	4.50	.50	5.00
					3/4	.50	5.00	.55	5.50
					1	.55	5.50	.55	5.50
10	32	.190	9/32	.140	3/8	.45	4.50	.45	4.50
					1/2	.45	4.50	.45	4.50
					5/8	.45	4.50	.50	5.00
					3/4	.50	5.00	.55	5.50
					1	.55	5.50	.60	6.00
12	24	.216	5/16	.160	1/2	.45	4.50	.50	5.00
					5/8	.50	5.00	.55	5.50
					3/4	.50	5.00	.55	5.50
					1	.55	5.50	.60	6.00

Diameter is taken across flats.

HEXAGON NUTS

All Nuts are milled from the bar. No. 3 and larger have washer face.

Screw Size	No. Threads Per Inch	Dia. of Nut	Length of Nut	STEEL Price Per Doz.	STEEL Price Per Gro.	BRASS Price Per Doz.	BRASS Price Per Gro.
0	80	5/32	.048	$ .25	2.50	.25	2.50
1	72	7/64	.063	.28	2.80	.28	2.80
2	56	1/8	.075	.30	3.00	.30	3.00
3	48	5/32	.087	.35	3.50	.35	3.50
4	40	3/16	.098	.38	3.80	.38	3.80
5	40	7/32	.108	.40	4.00	.40	4.00
6	32	7/32	.125	.45	4.50	.45	4.50
8	32	1/4	.140	.45	4.50	.45	4.50
10	32	9/32	.165	.50	5.00	.50	5.00
12	24	5/16	.185	.55	5.50	.55	5.50

WRENCHES

	Each
•Single Open End Wrenches to fit Hexagon Head Screws and Nuts	$ .45
•Socket Wrenches to fit Hexagon Head Screws and Nuts	.75
•Double Open End Wrenches (Molybdenum Steel), openings 30 and 60 degree Angle	1.00

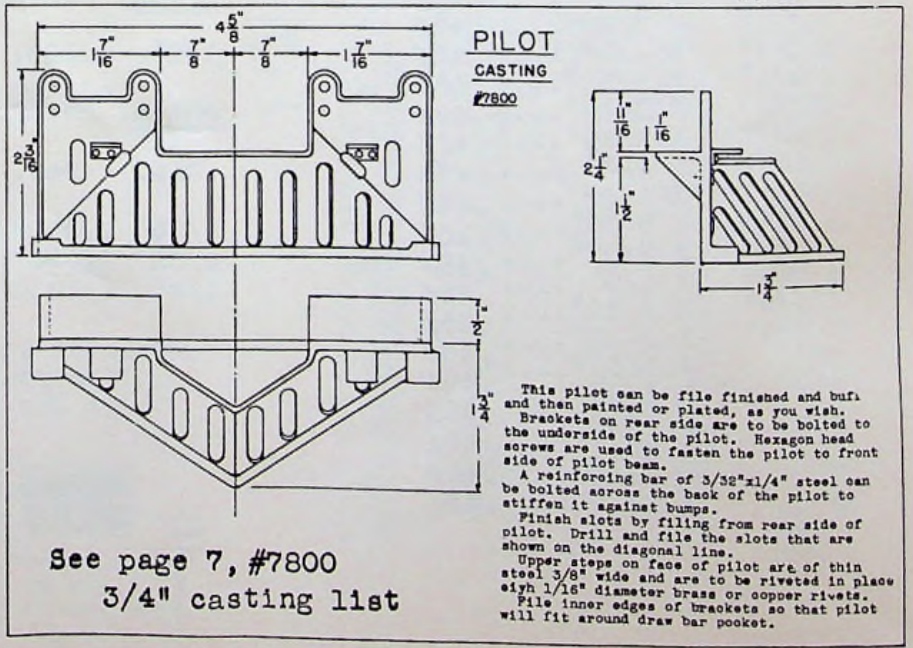
*Specify openings wanted.

TIMKEN ROLLER BEARINGS

No. 23

For ¾" drive wheel axles. Roller bearing and roller bearing race (two each required per axle). Price per one set of bearing and race.....$1.55

No. 23



This pilot can be file finished and buff and then painted or plated, as you wish.

Brackets on rear side are to be bolted to the underside of the pilot. Hexagon head screws are used to fasten the pilot to front side of pilot beam.

A reinforcing bar of 3/32"x1/4" steel can be bolted across the back of the pilot to stiffen it against bumps.

Finish slots by filing from rear side of pilot. Drill and file the slots that are shown on the diagonal line.

Upper steps on face of pilot are of thin steel 3/8" wide and are to be riveted in place eiyh 1/16" diameter brass or copper rivets.

File inner edges of brackets so that pilot will fit around draw bar pocket.

See page 7, #7800
3/4" casting list

FILLISTER, ROUND AND FLAT HEAD SCREWS

Sizes 0-80 and 1-72 are milled from the bar with cut threads.
Sizes 2-56 and 3-48 are commercial screws with rolled threads.

Flat — Fillister

Machine Screws — FILLISTER, ROUND AND FLAT HEAD — Round

Screw Size	No. Threads Per Inch	Length of Screw	STEEL or BRASS Price Per Doz.	Price Per Gro.
0	80	1/8	.25	3.00
		3/16	.28	3.20
		1/4	.30	3.50
		5/16	.32	3.80
		3/8	.35	4.00
		1/2	.35	4.00
		5/8	.40	4.50
1	72	1/8	.25	3.00
		3/16	.28	3.20
		1/4	.30	3.80
		3/8	.35	4.00
		1/2	.35	4.50
		5/8	.40	4.00
2	56	1/8, 3/16, 1/4	.07	.56
		5/16	.07	.67
		3/8, 1/2	.08	.79
		5/8	.09	.99
		3/4	.10	1.21
		7/8	.12	1.35
3	48	1/4	.08	.56
		5/16	.09	.67
		3/8, 1/2	.09	.79
		5/8	.10	.99
		3/4	.12	1.21
		7/8	.14	1.43
4	40	1/4	.08	.62
		5/16	.09	.71
		3/8, 1/2	.09	.82
		5/8	.10	1.07
		3/4	.12	1.28
		7/8 2.25	.14	1.39
5	40	1/4 1/8,	.14	.78
		3/8	.15	.93
		1/2, 5/8	.17	1.10
		3/4	.20	1.46
		7/8, 1	.24	1.73
6	32	3/8	.14	.82
		1/2	.15	.97
		5/8	.17	1.13
		3/4	.20	1.43
		1	.24	1.75
8	32	3/8	.16	1.12
		1/2	.19	1.35
		5/8	.22	1.58
		3/4	.29	2.10
		1	.33	2.47
10	32	3/8	.16	1.12
		1/2	.19	1.35
		5/8	.22	1.58
		3/4	.29	2.10
		1	.33	2.47

Hex. Nuts

Steel Gross	Steel Doz.	Brass Gross	Brass Doz.
3.60	$ .35	$3.60	$ .35
....	....	....	....
....	....	....	....
....	....	....	....
3.95	.40	3.95	.40
....	....	....	....
....	....	....	....
....	....	....	....
.63	.17	.80	.18
....	....	....	....
....	....	....	....
....	....	....	....
.65	.17	.87	.20
....	....	....	....
....	....	....	....
.64	.17	.94	.20
....	....	....	....
....	....	....	....
....	....	....	....
.52	.15	1.15	.22
....	....	....	....
....	....	....	....
....	....	....	....
.57	.16	1.35	.24
....	....	....	....
....	....	....	....
....	....	....	....

Rubber Tube

RUBBER TUBE—is soft rubber for flexible connections and packing water gauge glasses. Inside diameters are given.

Inside Diameter, inches	1/16	3/32	1/8	3/16	1/4	5/16	3/8
Wall thickness, inches	1/32	1/32	3/64	1/16	1/16	1/16	1/16
Price per foot	$.14	$.15	$.12	$.10	$.11	$.12	$.16

SPRING COTTER PINS

STEEL or BRASS

Spring cotter pins are measured in length from under the eye. All orders are filled according to the diameters specified although they are made a trifle smaller in diameter in order to allow easy insertion into the hole.

Diam. inch	Lgth. inch	Doz.
1/16 x	1/2	$ .10

1/16 x (No. 16)	3/4	.10
	1	.10
	1 1/2	.10
3/32 x (No. 13)	3/4	.11
	1	.11
	1 1/2	.09
1/8 x (No. 11)	3/4	.09
	1	.09
	1 1/2	.08
5/32 x	3/4	.09
	1	.10

BRASS ESCUTCHEON PINS

These escutcheon pins have well shaped heads and make excellent round-head rivets

Number	Length	Diameter Head	Diameter Body	Ounce Price	1/4 Lb. Price	1/2 Lb. Price
20	1/8	.035	.072	$ .42	$1.45	$2.40
	1/4			42	$1.45	$2.40
	3/8			.40	1.55	2.50
22	1/8	.029	.060	.50	2.00	2.75
	1/4			.45	1.75	2.75
	3/8			.40	1.55	2.50
24	1/8	.023	.048	.60	2.40	3.25
	1/4			.55	2.10	3.10
	3/8			.45	1.65	2.75

Non-Corrosive Balls

No. 24

For pumps, safety, and check valves.

Diam.	Stainless Steel Ea.	Stainless Steel Doz.	Bronze Ea.	Bronze Doz.	Diam.	Stainless Steel Ea.	Stainless Steel Doz.	Bronze Ea.	Bronze Doz.
1/8"	.05	.50	.05	.50	7/32"	.05	.50	.05	.50
5/32"	.05	.50	.05	.50	1/4"	.07	.60	.07	.60
1/8"	.05	.50	.05	.50	5/16"	.10	.75	.10	.75
5/32"	.05	.50	.05	.50	3/8"	"	"	"	"
1/4"	.05	.50	.05	.50					

No. 25

ROLLERS

No. 25

For booster trucks, tank trucks, and car trucks. These serve to catch the weight of car or engine when they heel over on turns or lurch on the straightaway. each .....$ .30

Extra Fine Bronze Wire Cloth

Plain

This brass wire strainer cloth is made from a good grade of brass wire but woven as heavy as the market grade.

To be used for straining fluids where indicated.
80 mesh. Price per square inch..... 10¢
100 Mesh. Price per square inch..... 10¢
(Minimum order 2 sq. in.)

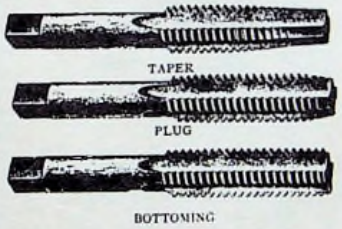
MORSE STRAIGHT SHANK DRILLS

Deci. Inch	Frac. Inch	Drill No.	Price Each
.0135	....	80	.20
.0145	....	79	"
.0156	1/64	..	"
.0160	....	78	"
.0180	....	77	"
.0200	....	76	"
.0210	....	75	"
.0225	....	74	"
.0240	....	73	"
.0250	....	72	"
.0260	....	71	"
.0280	....	70	"
.0292	....	69	"
.0310	....	68	"
.0313	1/32	..	"
.0320	....	67	"
.0330	....	66	"
.0350	....	65	"
.0360	....	64	"
.0370	....	63	"
.0380	....	62	"
.0390	....	61	"
.0400	....	60	"
.0410	....	59	"
.0420	....	58	"
.0430	....	57	"
.0465	....	56	"
.0469	3/64	..	"
.0520	....	55	"
.0550	....	54	"
.0595	....	53	"
.0625	1/16	..	"
.0635	....	52	"
.0670	....	51	"
.0700	....	50	"
.0730	....	49	"
.0760	....	48	"
.0781	5/64	..	"
.0785	....	47	"
.0810	....	46	.18
.0820	....	45	"
0860	....	44	"
.0890	....	43	"
.0935	....	42	.18
.0938	3/32	..	"
.0960	....	41	"
.0980	....	40	"
.0995	....	39	"
.1015	....	38	"
.1040	....	37	"
.1065	....	36	"
.1094	7/64	..	"
.1100	....	35	"
.1110	....	34	"
.1130	....	33	"
.116	....	32	"
.120	....	31	"
.125	1/8	..	"
.129	....	30	"
.136	....	29	"
.140	9/64	..	"
.141	....	28	"
.144	....	27	.25
.147	....	26	"
.150	....	25	"
.152	....	24	"
.154	....	23	"
.156	5/32	..	"
.157	....	22	"
.159	....	21	"
.161	....	20	"
.166	....	19	"
.170	....	18	"
.172	11/64	..	"
.173	....	17	"
.177	....	16	"
.180	....	15	.22
.182	....	14	"
.185	....	13	"
.188	3/16	..	"
.189	....	12	"
.191	....	11	"
.194	....	10	"
.196	....	9	"
.199	....	8	"
.201	....	7	.35
.203	13/64	..	"
.204	....	6	"
.206	....	5	"
.209	....	4	"
.213	....	3	"
.219	7/32	..	"
.221	....	2	"
.228	....	1	"
.234	....	A	.30
.234	15/64	..	"
.238	....	B	"
.242	....	C	"
.246	....	D	"
.250	1/4	..	"
.250	....	E	"
.257	....	F	"
.261	....	G	"
.266	17/64	..	"
.266	....	H	"
.272	....	I	"
.277	....	J	.39
.281	9/32	..	"
.281	....	K	"
.290	....	L	"
.295	....	M	"
.297	19/64	..	"
.302	....	N	"
.313	5/16	..	"
.316	....	O	"
.323	....	P	"
.328	21/64	..	"
.332	....	Q	.48
.339	....	R	"
.344	11/32	..	"
.348	....	S	"
.358	....	T	"
.359	23/64	..	"
.368	....	U	"
.375	3/8	..	.70
.377	....	V	"
.386	....	W	"
.391	25/64	..	"
.397	....	X	.85
.404	....	Y	"
.406	13/32	..	"
.413	....	Z	.85
.422	27/64	..	"
.438	7/16	..	"
.453	29/64	..	1.00
.469	15/32	..	1.10
.484	31/64	..	1.20
.500	1/2	..	1.30

These taps and drills are all Carbon steel. If you wish High Speed please double the price,

MACHINISTS' HAND TAPS

CARBON STEEL



No. 1040. Plug Taps—Right-hand Threads

Three Flutes

Diam. of Tap Inches	N.C. (U.S.S.) Threads	N.F. (S.A.E.) Threads	N.S. (U.S.F.) Threads	Whole Length Inches	Each
1/16	..	..	64	1 5/8	$0 70
3/32	..	..	48	1 3/4	.70
1/8	..	..	40	1 13/16	.50

Four Flutes

5/32	..	..	32, 36	2 1/16	.50
3/16	..	..	24, 32	2 3/8	.60
7/32	..	..	24, 32	2 3/8	.70
1/4	20	28	24, 27, 32	2 1/2	.70
5/16	18	24	20, 27, 32	2 23/32	.70
3/8	16	24	20, 27	2 15/16	.75
7/16	14	20	24, 27	3 1/32	.80
1/2	13	20	12, 24, 27	3 3/8	.90

No. 1066. Plug Taps—Right-hand Threads

0	..	80	.....	1 5/8	$0 60
1	64	72	56	1 11/16	.60
2	56	64	.....	1 3/4	.55
3	48	56	.....	1 13/16	.50
4	40	48	32, 36	1 7/8	.50
5	40	44	.....	1 13/16	.45
6	32	40	36	2	.45
8	32	36	40	2 1/8	.45
10	24	32	30	2 3/16	.50
12	24	28	32	2 5/8	.55
14			20, 24	2 1/2	.55

TAPER AND BOTTOMING TAPS, same sizes and same price.

MORSE HAND REAMERS SPIRAL FLUTE

FOR STEEL AND IRON

No 34

These reamers are made to meet the heavy demands of modern production methods, are sturdy, and built for service.

Size	1/8"	5/32"	3/16"	1/4"	5/16"	21/64"	11/32"	23/64"	3/8"	1/2"
Price	$1.70	$2.00	$2.00	$2.15	2.15	$2.15	$2.15	$2.15	$2.50	$3.00

These reamers are Carbon steel. If you wish High Speed, double the price and specify same when ordering.

SCREW PLATE STOCKS

No. 1180. Stocks will hold solid and adjustable dies.

Size No.	Length Inch	For Dies Diam., In.	Wt. Lbs. Each	Each
22	7 3/8	1 13/16	3/16	1.85

ROUND ADJUSTABLE DIES

No. 1184. Machine Screw Sizes
National Standard Threads—Right-hand
1 13/16 Inch Diameter, 1/4 Inch Thick
Threads to Inch

Screw Ga. No.	N.C. (U.S.S.)	N.F. (S.A.E.)	N.S. (U.S.F.)	Each
0	80	72	..	$1.50
1	64	72	56	1.50
2	56	64	..	1.50
3	48	56	..	1.50
4	40	48	32, 36	1.50
5	40	44	..	1.50
6	32	40	36	1.50
8	32	36	40	1.50
10	24	32	30	1.25
12	24	28	32	1.25
14	..	..	20, 24	1.25

No. 1184. National Standard Threads—Right-hand
1 13/16 inch diameter, 1/4 inch thick.
Threads to Inch

Size Inch	N. C. (U. S. S.)	N. F. (S. A. E.)	N. S. (U. S. F.)	Each
1/8	..	72	64	$1.60
5/32	..	..	48	1.70
3/16	..	..	40	1.45
7/32	..	..	..	1.45
1/4	..	..	32, 36	1.50
5/16	..	..	24, 32	1.50
7/32	..	..	24, 32	1.60
1/4	20	28	24, 27, 32	1.70
5/16	18	24	20, 27, 32	

"HANDY" BRAZING FLUX

For brazing steel, stainless steel, monel metal, nickel, copper, beryllium-copper, brass, bronze, aluminum bronze and various other ferrous and non-ferrous metals and alloys.

Especially suitable for use with Easy-Flo Brazing Alloy and Sil-Fos. All Borax or Borax Base compounds have a high melting point, therefore are not satisfactory for use with these low melting alloys.

"Handy" Flux having wide temperature range works effectively with all Silver Solders and alloys having flow points from 1100 degrees F. to 1600 degrees F. It remains stable between these temperatures and does not bubble or blow away under the torch. Saves fluxing time, speeds up and improves brazing. Directions for use printed on label of every jar.

8 Ounce Jars.....each $1.65

EASY-FLO BRAZING ALLOY

Meets Navy Specifications 47-S-BC, Grade IV
Meets Federal Specifications QQ-S-561B, Class IV

A low temperature brazing alloy for iron, steel, stainless steel, Monel metal, Everdur, Inconel, copper, brass, bronze, nickel, copper-nickel and chrome-nickel alloys. Free-flowing at 1175 degress F. Contains 50% Silver.

It is especially effective for making joints between dissimilar metals.

Easy-Flo also shows marked corrosion resisting properties under most conditions and compares favorably with other silver solders in this respect.

Tests snow that very strong joints can be made with **Easy-Flo,** tensile strengths ranging from 40,000 to 60,000 lbs. per sq. in. and in some cases higher depending upon the metals joined. Approximately 6½ feet to the Troy oz.

⅛ in. Diam. Wire—1 oz. coils.....Troy oz. $1.25

"KASENIT" HARDENING COMPOUND

A most rapid compound for open fire hardening. It is **non-poisonous, non-explosive, and non-inflammable.** It does away with objectionable and injurious fumes. It is made of pure chemicals, carefully selected and thoroughly mixed. It never varies in its composition and will produce uniform hardness. Ordinary case is given in a few minutes and deeper penetration is easily obtained.

Equally good results on all classes of steel, as well as cast, wrought or malleable iron. No special equipment or unusual methods are necessary; your smith's hearth, gas-jet or blowpipe will do. The compound melts under moderate heat and spreads itself over the entire surface to be hardened, forming a shell all over, thus eliminating the danger of soft spots or any tendency to warp.

1-lb. Cans.....each $2.50

MILFLEX MIDGET HACK SAWS

Frame is ¼" steel wire, nickeled finish, blued steel blade 6" long, ¼" wide, .014" thick, 30 teeth per inch (same as jewelers saw blades). Will cut soft metals and hard-woods. Price each, including blade.....65c

MILFLEX MIDGET HACK SAW BLADES

6", blue tempered, for soft metals and hard wood. Length 6", width ¼", thickness 28 gauge (.014), 32 teeth. Price each.....15c

SILVER SOLDER OR BRAZING ALLOY

For brazing band saws, etc., No. 40 Stubs' Gauge, .003 inch thick.

¾-inch wide. 7½ ft. per ounce.....Troy oz. $2.25

1 TROY OUNCE IN A CAN

WIRE SILVER SOLDER

No. 3. Diameter 1/16 inch, approx. 6 feet to troy ounce. One ounce coils. Melting point 1435 deg. F.....Troy oz. $2.25

SHEET PACKING

1/64" thick sheet packing of fabric and rubber, graphited for easy removal of gasket surfaces without destroying gasket each time, Suitable for steam cylinder heads, pump heads, etc. under pressures up to 125 p.s.i. saturated steam

Price per sq. ft..... 50¢

VALVE STEM PACKING

Valve stem packing for pistons, valve stems, globe valves, etc. Comes twisted in 1/16" strands to be untwisted for us in model work.

12" length..... 15¢

SIL-FOS BRAZING ALLOY

For low temperature brazing or welding brass, bronze, copper, nickel, silver and all other non-ferrous metals. It flows like water at 1300 deg. F. It penetrates instantly and alloys with the metal being joined, making an almost indestructable joint. Has corrosion resistance equal or greater than all non-ferrous metals it is commonly used on. "Sil-Flos" is easy to use, works fast, uses less flux, saves time and gas, therefore economical.

Diam. Inch	Length Inch	Per Oz.	Diam. Inch	Length Inch	Per Oz.
1/16 x .050	20	$ .75	3/32 Sq.	20	$1.00
1/8 x .050	20	.75	1/8 Sq.	36	1.00

BRASS SPELTER SOLDER

No. 103—Coarse long grain, for heavy sheet copper, brass, steel, cast iron, etc. Price per oz., 10c; price per lb.....$1.25

No. 92—Special grain, easy flowing, suitable for gas fixture and fine brass brazing work. Price per oz., 12c; price per lb.....$1.10

No. 43—Medium round grain for general brass, copper, and steel work. Price per oz., 10c; price per lb.....$1.05

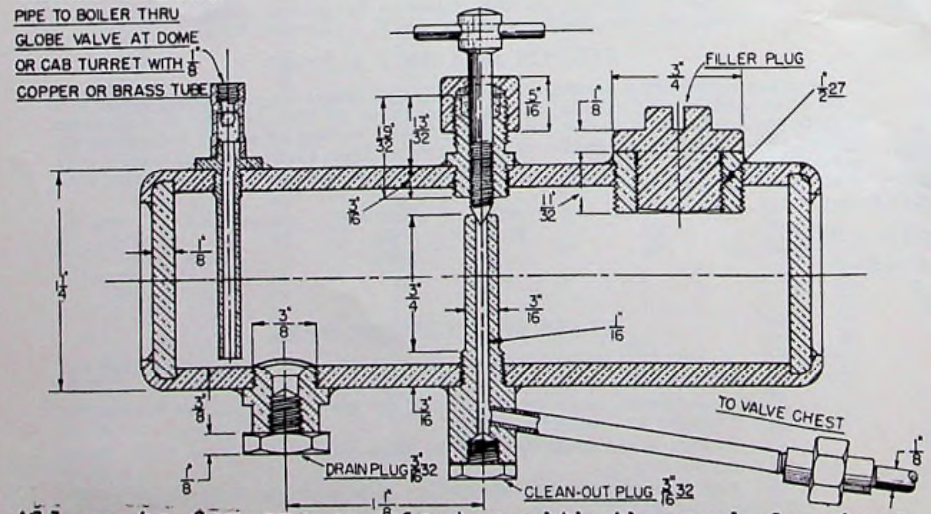
No. 61—Easy flowing, especially adapted for very light brazing work. Price per oz., 10c; price per lb.....$1.10

No. 6041—Fine ground grain, used for welding medium weight copper and brass. Price per oz., 10c; price per lb.....$1.10

LUBRICATOR

Shown for 3/4" and 1" scale locomotives, but the dimensions can be modified to suit any scale size engine. This lubricator of the displacement type was designed with a steam supply direct from the boiler instead of depending on the steam from branch pipes so that the lubricator will supply the valves and cylinders with oil at all times, whether the throttle is open or the engine standing. This feature insures having the oil ready for the cylinders from the start instead of having the valve and pistons running without oil until enough steam has passed from branch pipes to condense in the lubricator.

In other words, this lubricator is independent of the throttle so that when you are getting up steam, just open the steam valve in the line leading from boiler to lubricator and condensation takes place in the lubricator at once. Just before starting the engine, open the lubricator and oil starts to flow at once to the valve and cylinders. Piston valves especially need this oil from the start to avoid running with dry valves and pistons. A check valve is provided to stop any back flow of oil into boiler if the lubricator steam valve should happen to be left open when the engine is cooling down after the run. A one-half Section of the lubricator is shown below:



All parts for one lubricator with thorough drawings and instructions by Martin S. Lewis.....$3.50

MORSE TAPER PINS

Taper ¼" per ft.

Number	6/0	5/0	4/0	3/0
Diameter Large End ....inch	.072	.093	.108	.125
Approx. Fraction Size....inch	1/16	3/32	7/64	⅛
		Price per doz.		
½ in. length	$ .30	$ .30	$ .20	$ .20
¾ in. length	.32	.32	.22	.22
1 in. length	.35	.35	.24	.24
Taper Reamer to suit....each	1.75	1.70	1.65	1.60

MORSE COMBINED DRILLS AND COUNTERSINKS

Carbon Steel 

Included Angle 60°

Size	Diameter of Drill	Diameter of Body	Price Each
A1	No. 57 (.043")	⅛"	$ .42
C2	1/16" (.063")	13/64	.52
E1	3/32" (.094")	3/10	.60
E2	⅛" (.125")	3/10	.60

DECIMAL EQUIVALENTS OF PARTS OF AN INCH

Frac. inch	Dec. inch	Frac. inch	Dec inch		
1/64	.015625	33/64	.515625	¼	.2500
1/32	.031325	17/32	.53125	17/64	.265625
3/64	.046875	35/64	.546875	9/32	.28125
				19/64	.296875
1/16	.0625	9/16	.5625	5/16	.3125
5/64	.078125	37/64	.578125	21/64	.328125
3/32	093375	19/32	.59375	11/32	.34375
7/64	.109375	39/64	.609375	23/64	.359375
⅛	.1250	5/8	.6250	3/8	.3750
9/64	.140625	41/64	.640625	25/64	.390625
5/32	.15625	21/32	.65625	13/32	.40625
11/64	.171875	43/64	.671875	27/64	.421875
3/16	.1875	11/16	.6875	7/16	.4375
13/64	.203125	45/64	.703125	29/64	.453125
7/32	.21875	23/32	.71875	15/32	.46875
15/64	.234375	47/64	.734375	31/64	.484 .75
				½	.5000

1 1/2" SCALE
STEAM LOCOMOTIVE.

STEAM LOCOMOTIVE 1½" SCALE

7½" GAUGE

SPECIFICATIONS AND REMARKS

The following pages in this catalog are devoted to our 1½" scale steam locomotive, and we hope that we have presented it in a comprehensive manner. However, due to the minute and particular detail incorporated in this engine, the space here allows only an outline of the work.

In starting we would like to say that we have not tried to make a cheap or inexpensive engine. We have built the kind of an engine that we want, and the only kind that we feel is worth putting the necessary time, etc. into. When one builds a locomotive of this size it can be a work of art, it can be beautiful, and it can give great satisfaction to the builder. With this object in view, we built our engine, and our patterns and parts carry out every fine detail of the prototype. Note that the back of the drive wheels (see page 51) are as beautifully detailed as the front. Also that we have right and left drive wheels on account of the six degrees difference in the counterbalance centerlines on the prototype. Please also note the Buckeye tender truck, and especially the centerplate (see page #48) which is authentic in every detail, including a very intricate coring job, and this item is practically invisible when the tender is completed. These are only a few examples of the thoroughness of this work.

Details are complete with working air brakes, steam driven air pump, steam driven feed water pump, automatic cylinder cocks, drifting valves, and automatic drain cocks on all air and steam lines. Water gauge in latest type in line with standard practice is provided. Steam dryer: smoke box throttle chamber type built into manifold. U.S. Steam gauge reading 0-280#, and "sweeps" 270 degrees. Pop valves in perfect miniature made by the manufacturer of standard full size valves, adjusted, tested, and set and sealed at factory. All drive axles are on Timkin bearings, adjustable. Drive axles also have lateral device permitting a lateral movement of 5/64" to take care of minimum radius track curves. Sealed bearings on all truck axles take care of lubrication for life of bearings.

Constant loaded centering devices on both trailer and leading truck. Spring loaded buffer and wear plate between engine and tender, detailed from full size practice. Spring rigging equalized throughout main spring system in connection with trailer truck springs. Weight adjustment provided for all spring equalizer levers. Brake rigging according to full size. Brake shoes removable from brake beams. Complete brake adjustment provided for.

Valve, cylinder and crosshead lubrication is by ratchet type mechanical lubricators driven by combination levers. Two pumps in each lubricator case. Pumps have outside adjustment so that stroke of pumps can be easily adjusted to give just the right quantity of oil to insure adequate lubrication of pistons, valves and crossheads. These mechanical oilers are miniatures of the full size ones and can be cranked to supply oil prior to starting run after steaming up. While engine is running the oil is pumped mechanically and supplies oil until refill is necessary.

Snifter valves, properly called drifting valves, are provided and they screw into the steam chests and take in the air when the throttle is closed and engine is drifting to a slow down or stop. The valves open when drifting and instead of the steam chests taking in smoke and cinders via the exhaust nozzle, they permit outside air to enter as long as engine is drifting with throttle closed. When the throttle is opened these valves snap shut and remain shut while working steam. The valve seats are of tobin bronze.

Side rods are tandem type, no knuckle joints. Rod bearings have floating bushings.

TYPE: Most of our data was taken from the Union Pacific 825 series. As you know, all of a class per wheel arrangement are "sisters under the skin" as far as foundation and running gear are concerned. The difference being that some roads have a preference for Baker valve gear, and others are partial to Walschaerts gear. Then the placement or location of accessories, shape of cab, domes, etc. In view of this it is possible to simulate most any engine of 4-6-4 or 4-8-4 types and use our parts and have the advantage of our fine prints and written instructions, which cover the work completely and thoroughly.

MAIN FRAMES: These are flame cut from cold rolled steel, which is first "box annealed" to prevent oxidation of surfaces. This leaves the sides in their original finish which saves a big planing or slot milling job, except for the little milling work on the edges in cutting out for the frame pedestal horns, or toes.

Most of the casting are nickel bronze, which has the machining qualities of cold rolled steel and this alloy has a tensil strength of well over 50,000 p.s.i

DRIVE WHEELES: 10" in dia. Baldwin box poc. We have the right and left hand drivers because the counterbalances are located six degrees off the vertical centerline on the prototype wheel and it is supposed to make for better cross balancing.

TRUCK WHEELS: Finish to 5-1/4" dia and all trucks are on ball bearings.

VALVE GEAR: Walschaerts.

SPRING RIGGING: Full standard leaf type and equalized through trailing truck.

TRAILER TRUCK: Has rocker centering device. The truck frame is cast all in one piece, and the detail is perfect as to prototype. The patternmaker spent over 100 hours on this pattern.

CYLINDER CASTING: 2-3/4" bore, 3-1/2" stroke, slide valve type finished to simulate piston valves. Cast "En-Block", thus eliminating a splice joint and enabling us to core the exhaust passages right up to the exhaust stand pipe. All ports and passages are cored in. Slide valves are used because they are easier to make and maintain steam tight than the pistoh valves, the latter requiring expert workmanship and careful fitting. The slide valve will start steam tight and wear will only make it better. In other words, it wears in.

CROSSHEADS: These are Dean type but can be machined so as to make the multiple edge type if preferred. Prints show machining of both types. We have tried to give an alternative wherever possible.

DRIVE AXLES: These are provided with a spring loaded lateral device and so all axles are in housings and mounted on adjustable roller bearings. The lateral movement is 5/32" throughout the rigid wheel base, 5/64" to the side. This internal device will enable the engine to take curves easily. We use 60 ft. minimum turning radius.

Alemite fittings on all crankpins and crankpins are hollow for retaining grease. This is to keep oil off the track.

Injectors and steam driven feed water pump furnish water required for boiler. Also a hand pump is installed.

Brakes using the old HS straight air valve for engine and tender. No brakes on either trailing or leading truck. Turbo electric generator supplies juice for the engine lights.

Length of engine and tender 14 ft. Engine pulls 14 ton easily.
Height 21½"
Fuel: Coal or oil
Working pressure 100#.

BOILER DIMENSIONS:

Dia of barrel 12", O.D.
Length of boiler 62-3/8"
Length of fire box 22-1/2"x14-1/2"
Length of flues 37-15/16"
66 crown stays
3 washout plugs, 1" welded steel couplings
4 " " 3/8" " " "
2 safety valve nozzles, welded steel couplings

Boiler is of 1/4" fire box steel throughout, except flue sheets which are 5/16". It is straight top. All joints are flush welded. The back head and throat sheet are flanged in the orthodox way. There are 22 flues 1" O.D., and 4 that are 3/4" O.D. Three 3/4" circulation tubes run from the back flue sheet to the back door sheet. Incidentally, the door edges in back head sheet are also flanged to meet and are welded. The fire box is 12"x19-5/16" in size. No combustion chamber is used, and steam dryer is of the grid iron type in the smoke box. The smoke box is 15" long.

****

CASTINGS FOR 1-1/2" SCALE STEAM LOCOMOTIVE
4-8-4, Union Pacific, 7-1/2" Track Gauge
(All castings in the rough)

Full sized, complete and fully detailed blue prints are furnished with all castings without extra charge. Also much written matter and working memorandums on the construction of the engine are provided with the drawings.

CASTING #	No. Req.	NAME	Material	Approx. Length	Approx. Wt.ea.	Price each	Price Set
FME 1	2	Main frames, flame cut, annealed	Steel	68"	77#	$28.50	$57.00
FME2-1	2	Main " cross ties.....	Nic. Br.	5"	4#	3.95	7.90
FME3-1	1	" " " "	" "	5½"	4½#		3.95
FME2-2	6	Brake hanger brackets.....	" "		1 #	1.00	6.00
FME3-2	2	" " brackets.....	" "		1⅛#	1.10	2.20
FME4-1	1	Cradle, portion of main frame.	" "	32"	50#		42.50
DRW5-1	4	Drive box & axle housings.....	" "		14#	9.85	39.40
DRS7-1	8	Drive wheels, light, medium & heavy C'balances, Rt. & Lt. sides	Iron		20#	5.50	44.00
MSP10-1	1	Transverse spring equalizer, bk.	Nic. Br.		1#		1.00
MSP10-2	1	" " " front	" "		1#		1.00
FME10-10	2	Spring seats, upper.....	" "		1#	1.00	2.00
FME11-1	1	Front buffer, frame spacer....	" "	10"	10#		9.50
BKE12-1	2	Brake hanger, back supports...	" "		1#	1.00	2.00
BKE12-2	6	" " supports.....	" "		1#	1.00	6.00
BKE12-7	8	" shoes.....	" "		1#	1.10	8.80
BKE12-10	2	" levers, bell crank.....	" "		1#	1.25	2.50
FME13-22	2	" " shaft bearings...	" "		2#	1.25	2.50
BKE13-27	1	Driver brake cylinder.....	" "		2#		2.50
BKE13-28	1	" " " head.....	" "		2#		1.50
BKE13-29	1	" " " head, front	" "		1#		1.00
TLR14-1	1	Trailing truck frame, cast unit	" "	29"	65#		72.50
TLR4-9	2	Trailer truck rockers.....	" "		1#	1.25	2.50
TLR15-3	4	Trailer truck journal boxes...	" "		2#	2.50	10.00
TLR15-4	4	" " " "covers	" "		1#	1.20	4.80
LDG16-1	1	Leading truck, cast in unit...	" "	15"	14#		16.50
LDG16-2	4	" " journal boxes....	" "		2#	2.25	9.00
LDG16-5	4	" " " " covers	" "		1#	1.10	4.20
LDG16-6	1	" " centerplate	" "		3#		2.50
LDG16-7	1	" " rocker plate.....	" "		2#		1.50
LDG16-8	1	" " " material..	" "		3#		2.50
CYL17-1	1	Cylinder block, cast in unit...	Cast Iron		35#		35.00
CYL18-1	2	Steam chests, right and left..	" "		7#		3.50
CYL18-2	2	" " covers, front....	Nic. bronze		1#	1.25	2.50
CYL18-3	2	" " " back.....	" "		1#	1.25	2.50
CYL18-5	2	Slide valves.....	Cast Iron		1#	1.25	2.50
CYL19-1	2	Valve stem crosshead guide brkts	Nic. Bronze		2#	2.50	5.00
CYL19-2	4	Guide bar spacers.....	Nic. Bronze		1#	.50	2.00
ROD19-7	2	Crossheads.....	" "		2#	3.00	6.00
CYL20-1	1	Centerplate for bottom of cyl.	Cast Iron		4#		2.50
CYL20-3	2	Cyl. bushing material, Centrifugal	" "		9#	3.00	6.00
CYL20-5	2	" heads front.....	Cast Iron		1#	1.10	2.20
CYL20-4	2	" " back.....	" "		1#	1.10	2.20
CYL20-7	2	Piston blanks.....	" "		1#	1.05	2.10
CYL20-1	2	Cylinder head covers, front...	Nic. Bronze		1#	1.25	2.50
CYL20-2	2	" " " back....	" "		1#	1.25	2.50
ROD22-1	2	Main rods, ...	" "	19"	7#	5.50	11.00
ROD22-5	2	Side rods, front.....	" "	13"	6#	5.00	10.00
ROD22-18	2	" " back.....	" "	13"	6#	5.00	10.00
ROD22-9	2	" " intermediate.....	" "	13"	6#	5.00	10.00
FME23-1	1	Main crosshead yoke.....	" "	14"	7#		6.50
FME23-3	1	" " Yoke & link support bracket.....	" "	18"	9#		9.25
FME24-2R	4	Link girders.....	" "	17"	7#	2.50	10.00
FME27-18	1	Pilot beam, cast hollow.....	Cast Iron	18"	7#		5.50
FME27-21	1	Pilot (cow catcher).....	" "		6#		5.00
FME27-22	2	" steps.....	" "		1#	1.00	2.00
SBX28-3	1	Smoke box door front.....	" "		4#		4.50
SBX28-2	1	" " " ring.....	" "		6#		6.00
SBX28-5	2	Okadee door hinges, 4 pcs.....	Nic. Bronze				5.00
SBX29-1	1	Smoke stack.....	Cast Iron		4#		2.75
SBX29-2A	1	Petticoat pipe.....	Nic. Bronze		3#		3.50
SBX29-3	1	Exhaust stand pipe.....	" "		3#		2.50
SBT33-1	1	Cab turret or fountain head...	" "		3#		2.50
SBT30-B	1	Throttle box bearing, 2 castings	" "		2#		2.00
FME27-23		Coupler full automatic.....	" "		1#	2.25	
FME27-24		" knuckle.....	" "			.50	

Castings, etc for 1-1/2" locomotive continued:

CASTING #	Req.	NAME	Material	Approx. Length	Approx. Wt.ea.	Price Each	Price Set
		BUCKEYE TENDER TRUCK PARTS: for 2 trucks					
BT-T38-1	2	Center plates, all cored out	C. Iron		14#	$7.00	$14.00
BT-T38-2	8	4 right and 4 left truck frames	"		8#	4.20	33.60
BT-T38-3	2	Equalizers.....	"		2#	2.20	4.40
BT-T38-5	4	Bolsters, cast hollow.....	"		5#	4.10	16.40
BT-T38-6	12	Journal lids.....	Nic. Bronze		1#	1.10	13.20
		Same truck wheels used on leading, trailer and tender trucks, cast iron.....				$2.00	

RAIL AND FASTENINGS:

1" high Dural rail, scaled from 150# ARA..... 25¢ per ft. $25.00 per 100 ft
Rail joints, die formed, rust resistant 8¢ each
Spikes to scale, but a little long to insure holding, plated... 350 for $1.00

We have sold and used this rail from 61S-T Alloy "Duralumin" since 1937, and in every case it has given complete satisfaction. The tractive effort improves with use, it is corrosion resistant, and due to the qualities of the alloy and forming process it has the tensil strength of steel and is hard and serviceable.

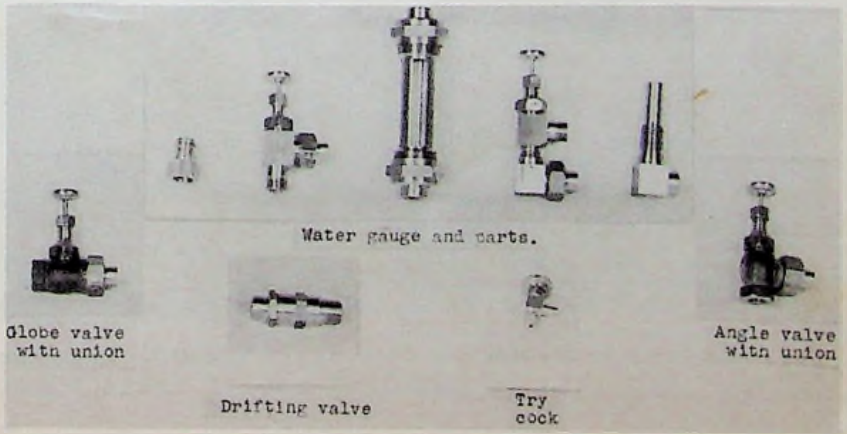
If mining rail could have been used successfully for this scale engine, it would have eliminated our going to the expense of having dies made to extrude the rail. But if one does use mining rail for this scale engine the track will be stiff and unyielding to the hammerlike blows of the drive wheel counterbalances, and this would "beat our locomotive to pieces". This has been proven in full size railroad practice, and the lightest rail capable of carrying the load with a factor of safety is used, so that there will be some flexibility or spring to the track to prevent destructive results from counterbalance impact. Wooden ties are used on rock ballasted road beds for further cushioning effect. Concrete ties have been tried, also concrete strips on which rail was fastened have been tried and discarded because they render the road bed too stiff. Even on steel bridges where it might be more convenient to bolt rails direct to the structrual frame work of the bridge, wooden ties are used under the rails, and this entirely for the cushioning effect. Our road beds must have elasticity, and only rail to scale will give this.

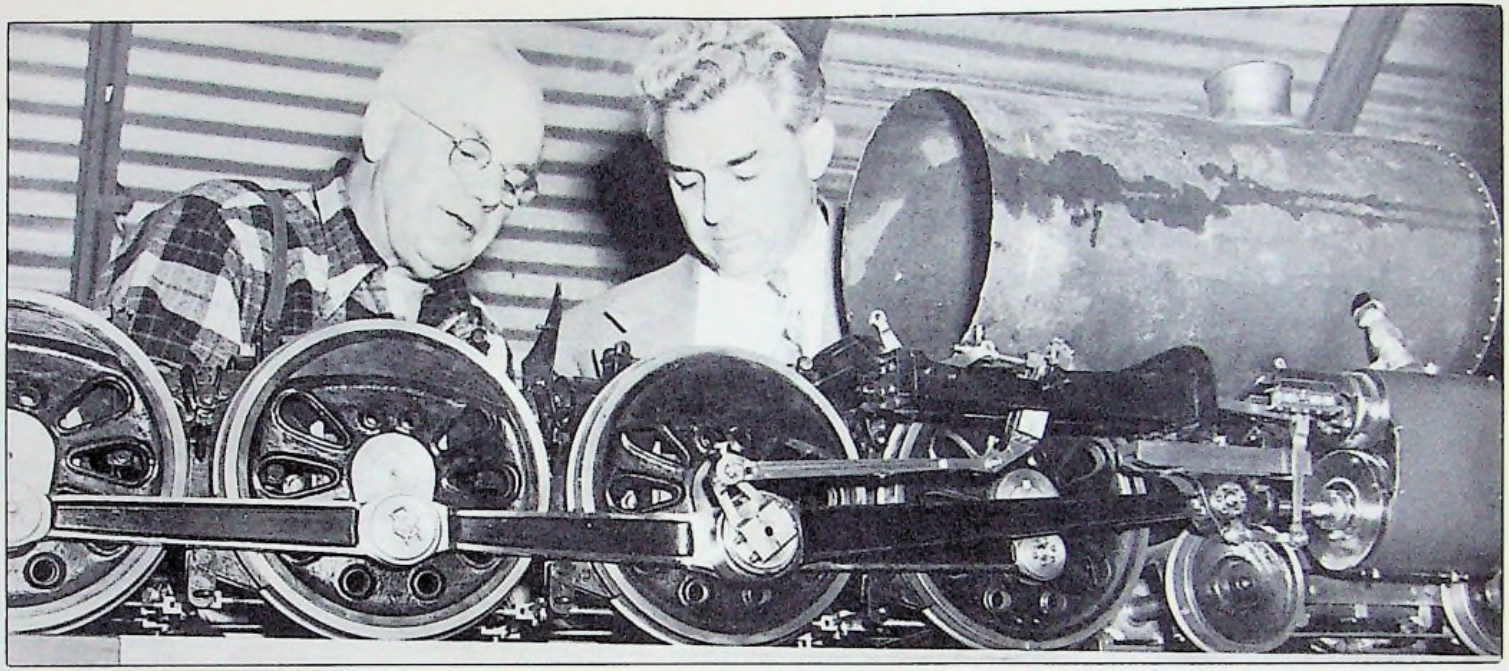
For 25¢ we shall send a generous sample of this rail and a pair of rail joints together with sample spikes, and in this way the fine quality of this rail and fastenings can be appreciated.

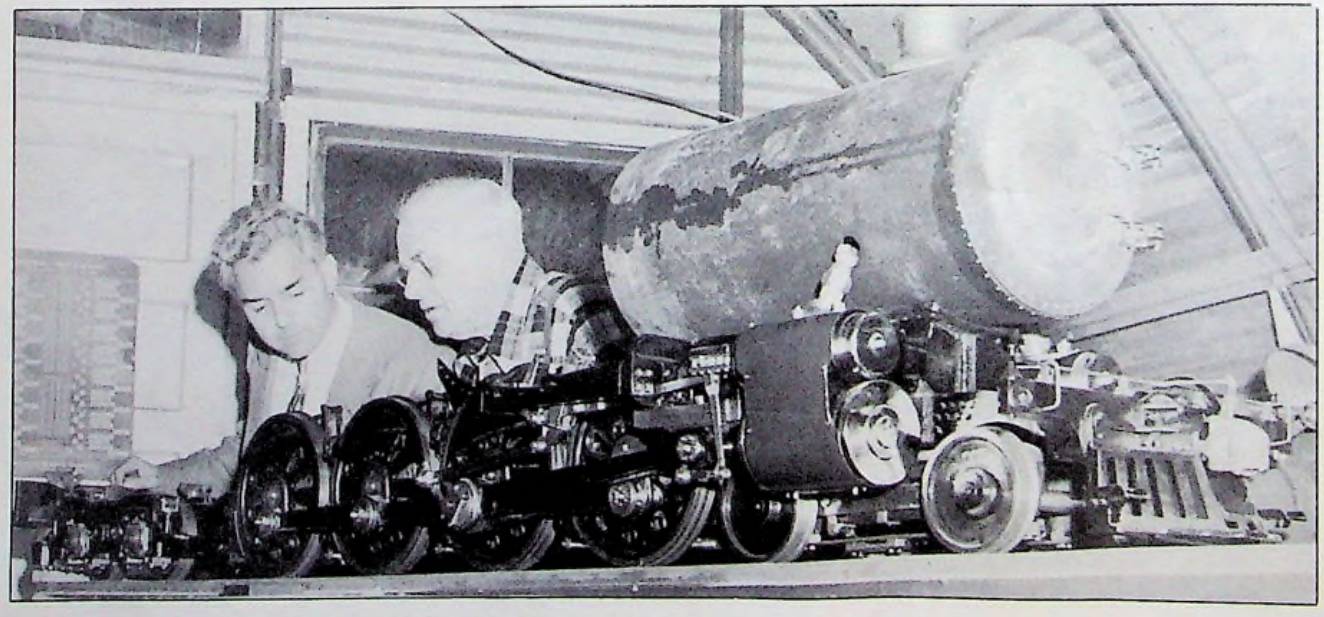
As stated above if the castings are purchased from us, the full sized, clearly dimensioned and detailed blue prints are furnished free. However, if one wishes to purchase the prints they are $2.00 per sheet.

As this catalog goes to press the patterns are being made for the car trucks, car wheels, and all parts pertaining to cars. And these will be available soon

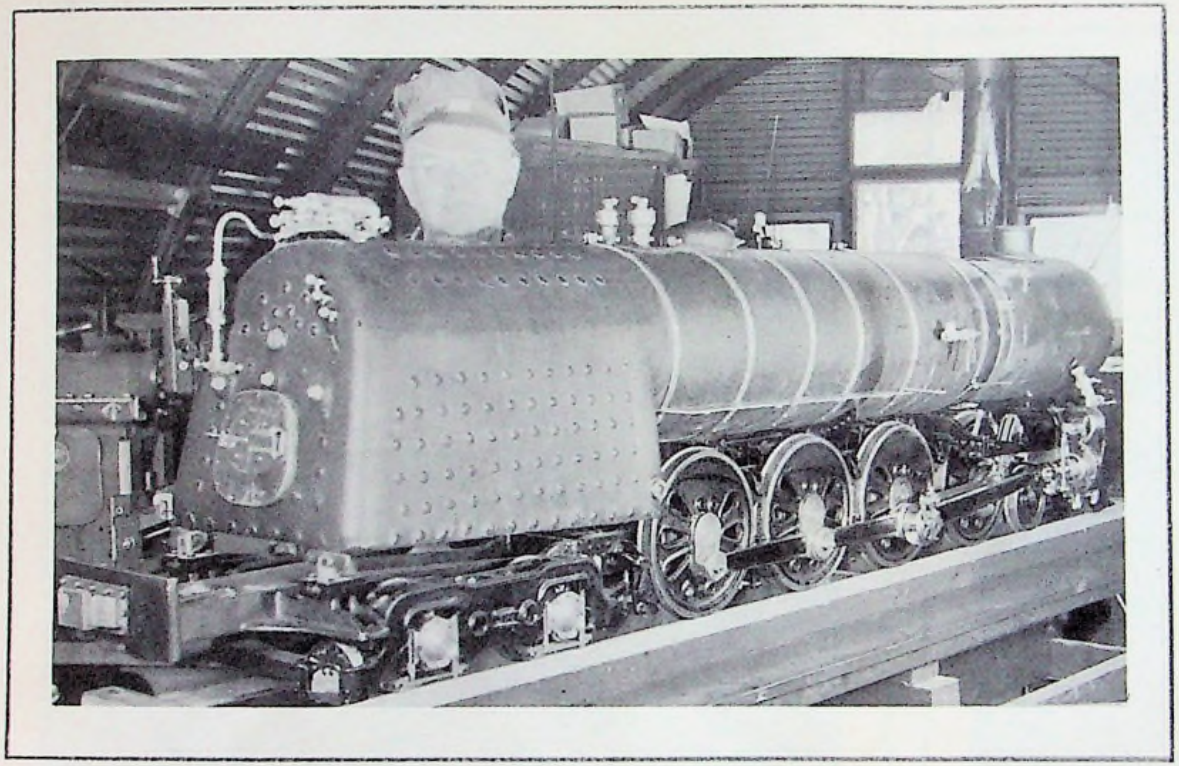
We can also furnish precision cut and punched spring leaves, roller and ball bearings, gits oilers, pop valves ready to install, snifter valves ready to apply, slip joints, water checks for cylinder drain cocks and other piping are all made up. We have piston rings, injectors, turbo generators for lights, duplex steam driven feed water pumps, air compressors, bells with air bell ringers, try cocks, and steam gauges. Note the water gauge at the bottom of this page and the angle and globe valves with unions attached, also the "snifter" or drifting valves. And a picture of the try cocks also appears.

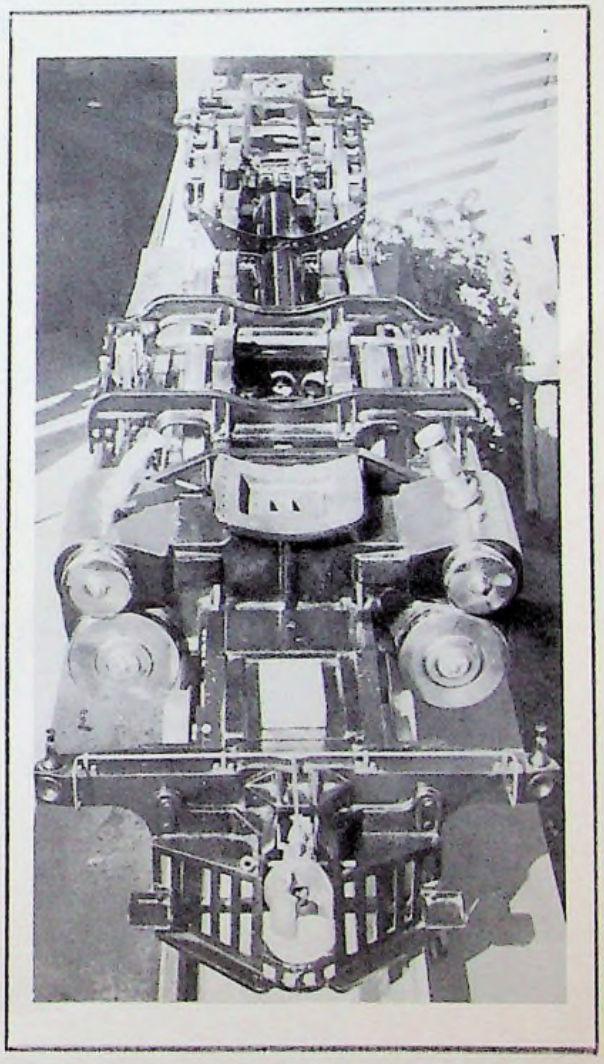


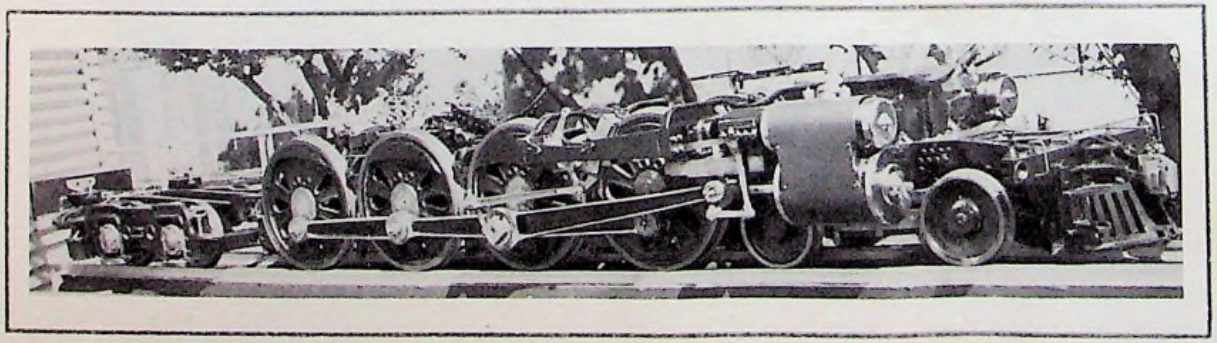


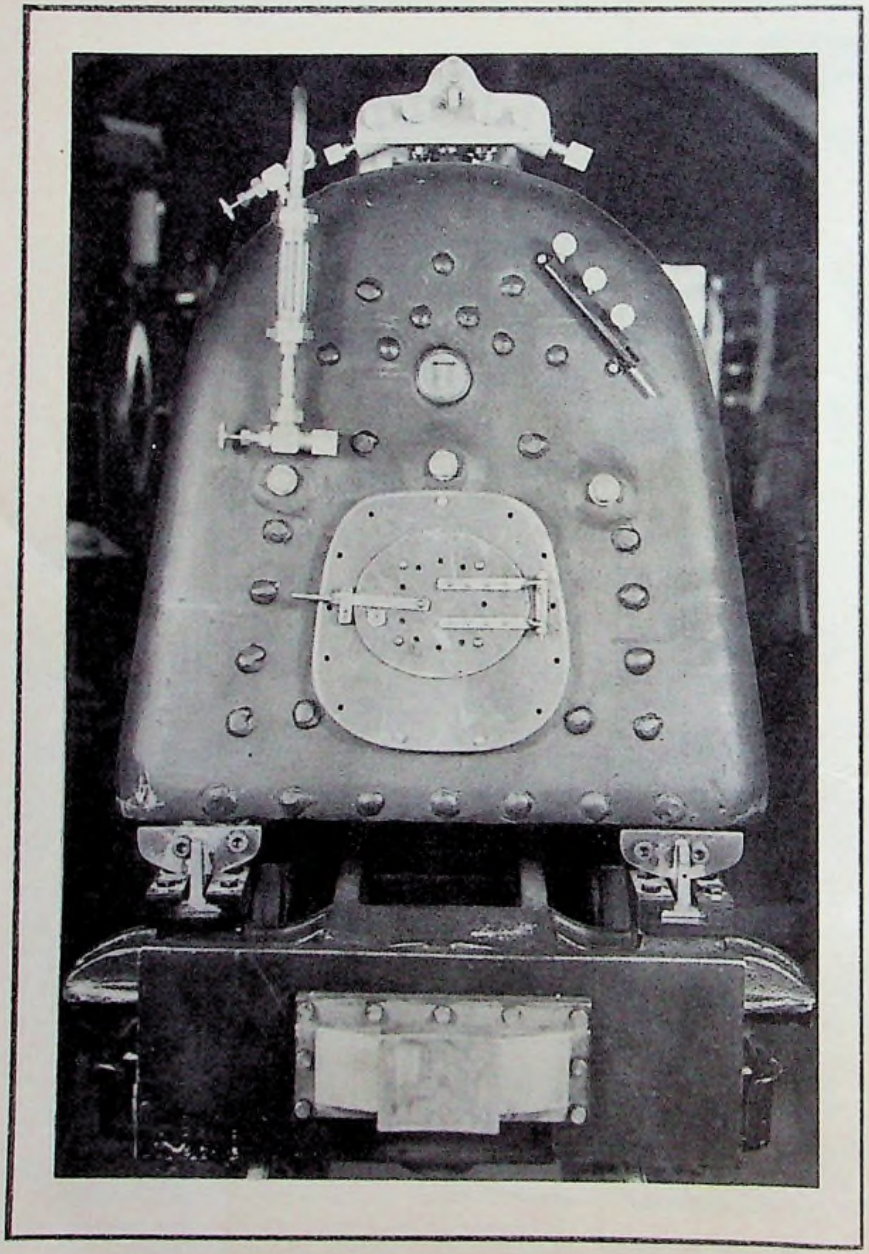


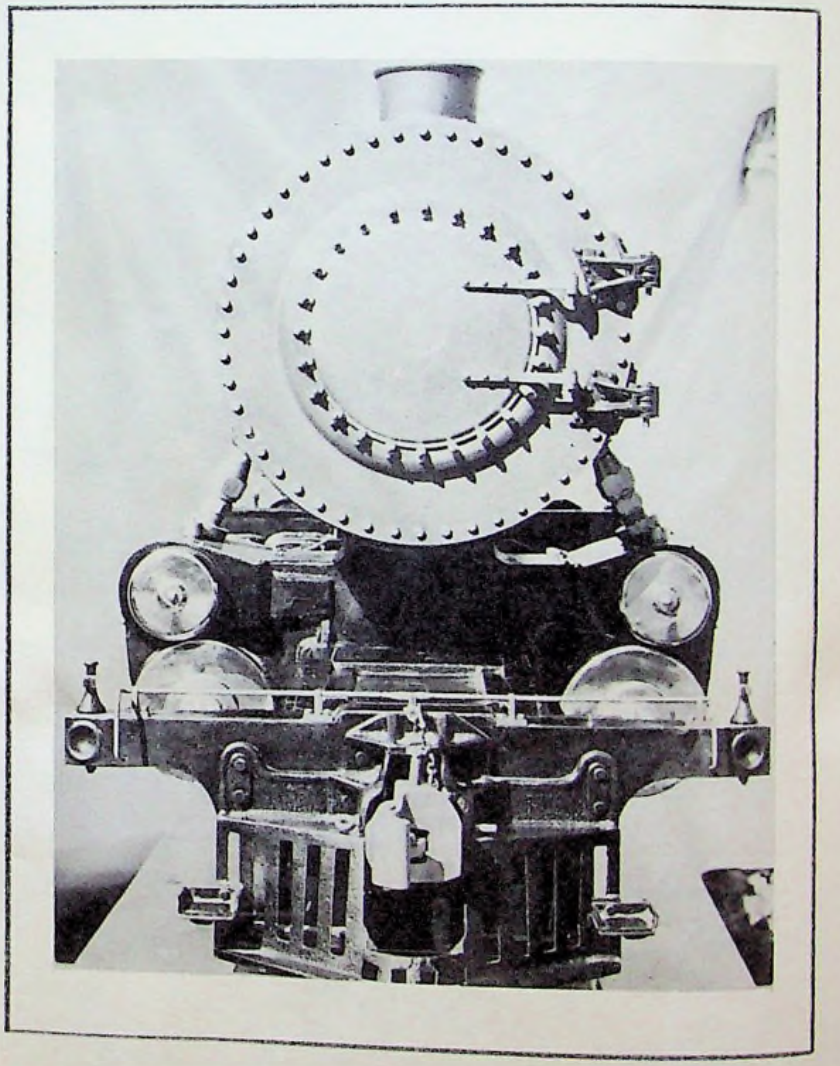
Martin S. Lewis (in plaid shirt) and friend Seymour F. Johnson, who is also building one of these engines. (Two views)

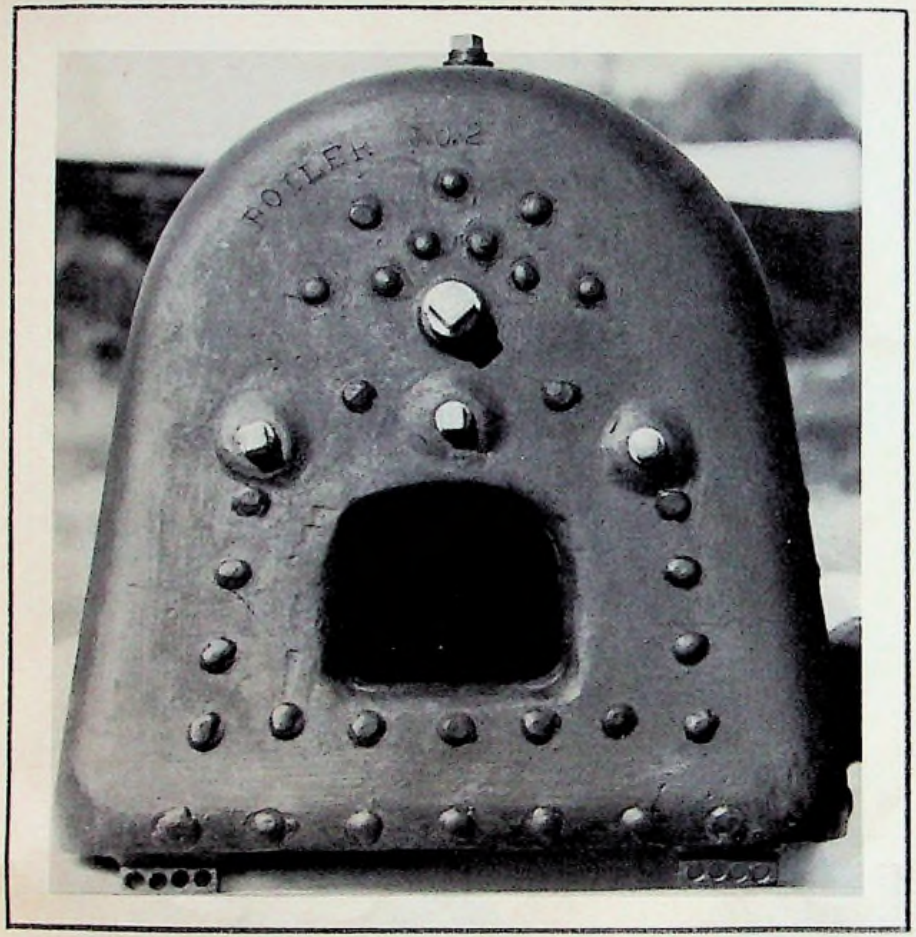


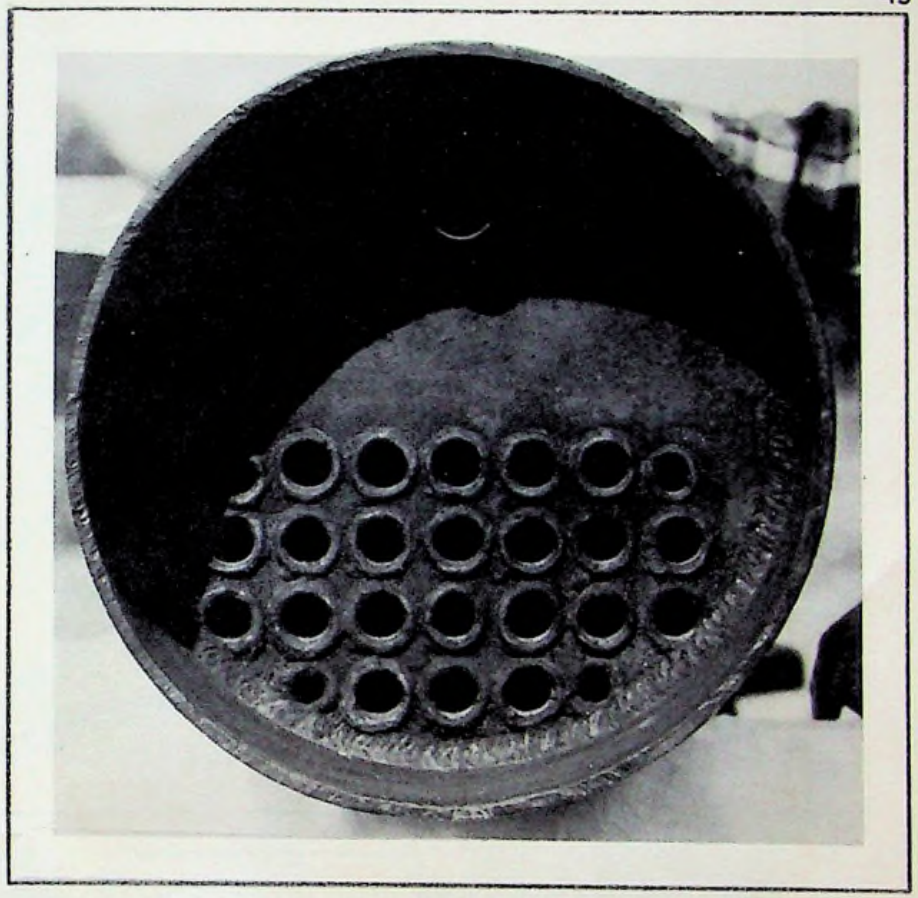


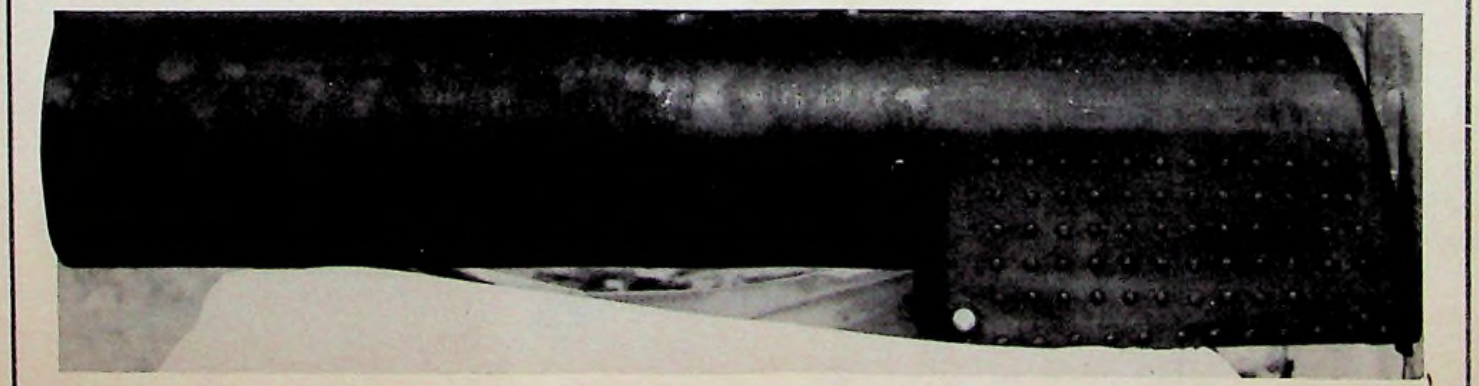


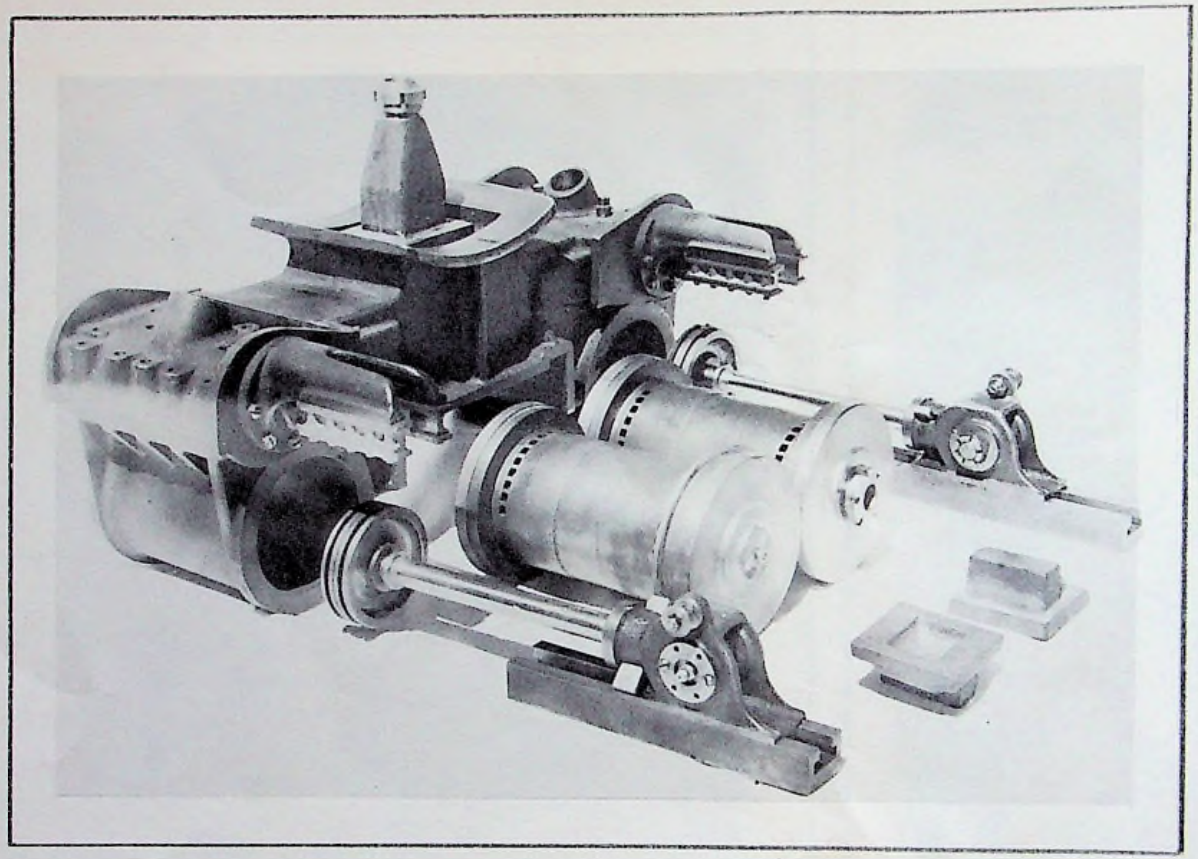




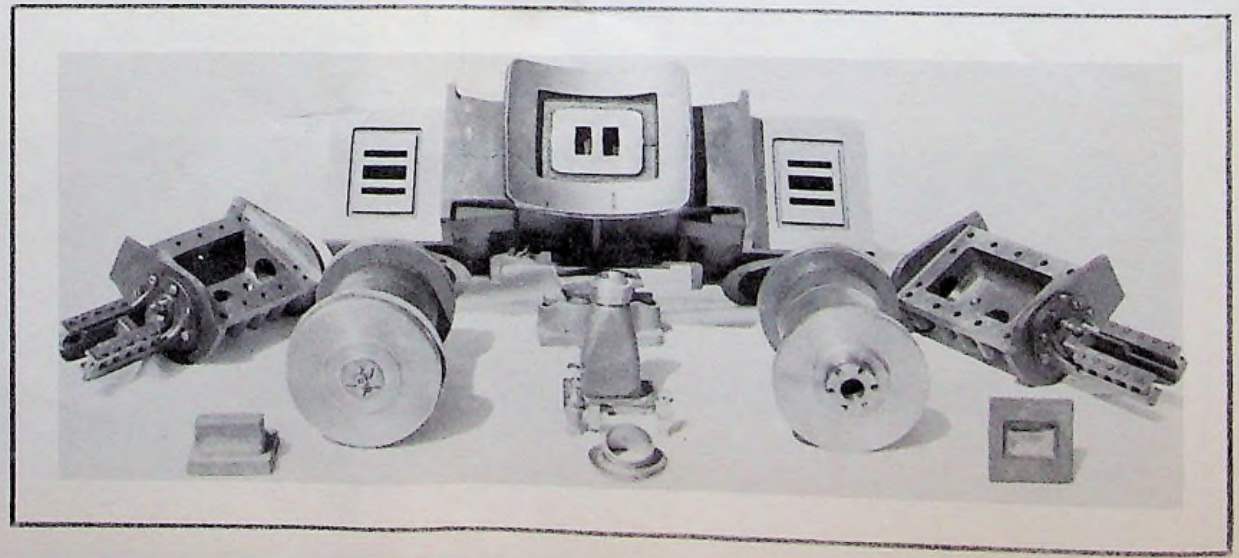

BOILER NO.2



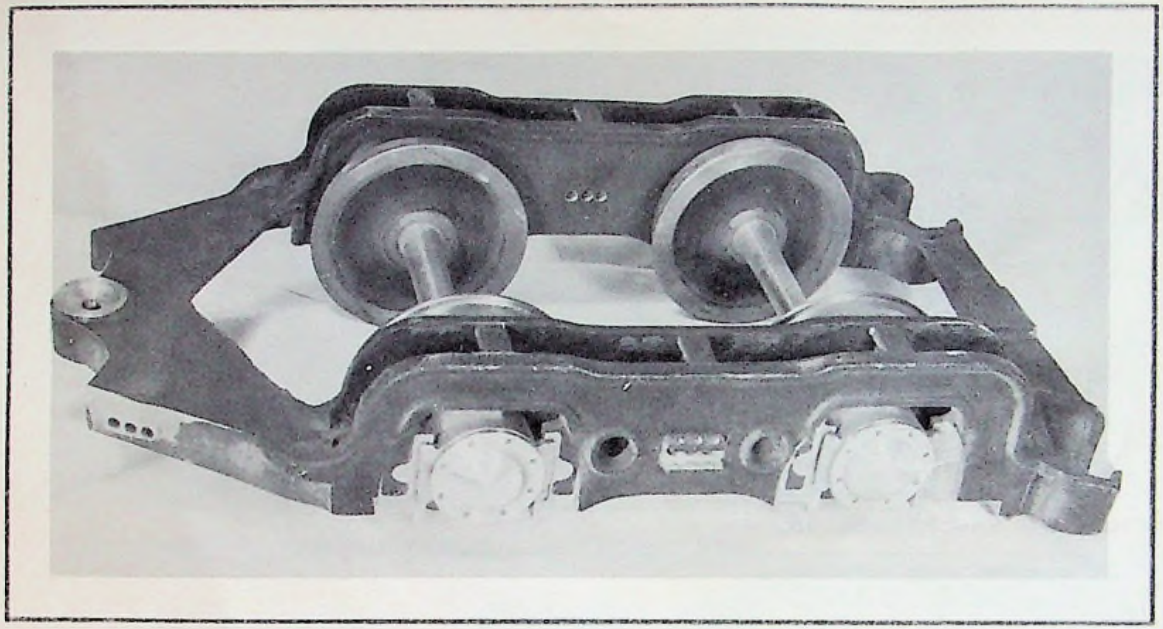




Cylinder block #CYL17-1, crossheads #ROD19-7, guides, pistons, slide valves, cylinder bushings & covers. The exhaust stand pipe, steam chests and valve stem crosshead guide brackets and spacers are shown in application. All parts are shown machined.

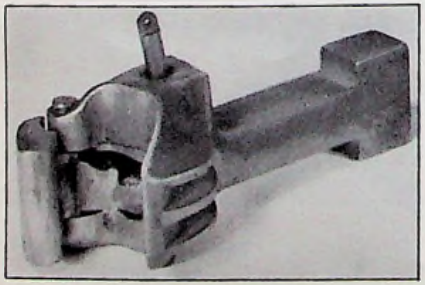


Cylinder block CYL17-1, steam chests #CYL18-1 slide valves, cylinder covers CYL20-1 & 2, & exhaust standpipe, shown machined and ready to assemble.

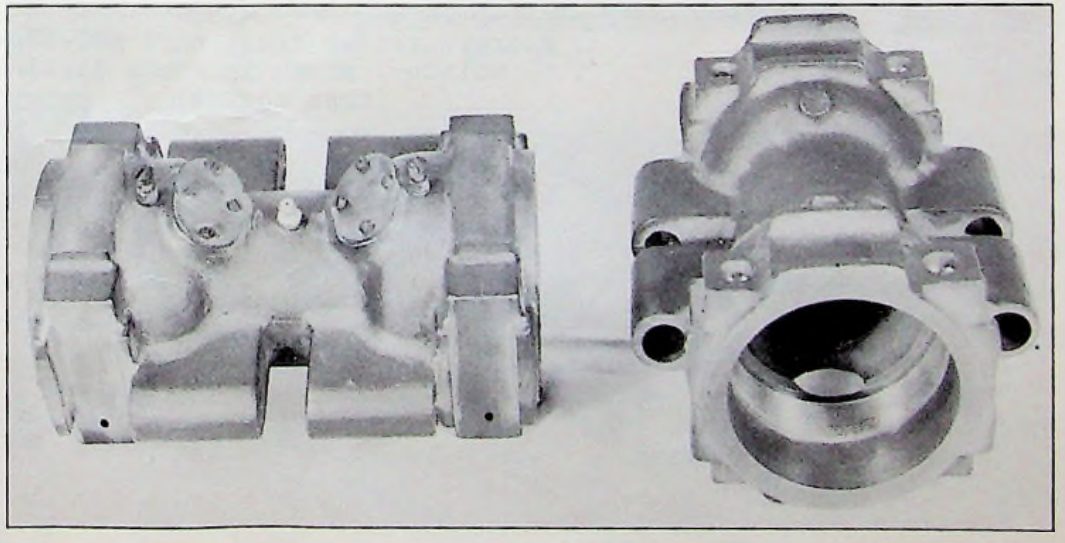


Trailer truck frame, cast unit #TRL14-1, shown finished with wheels, journal boxes, etc ready for application.

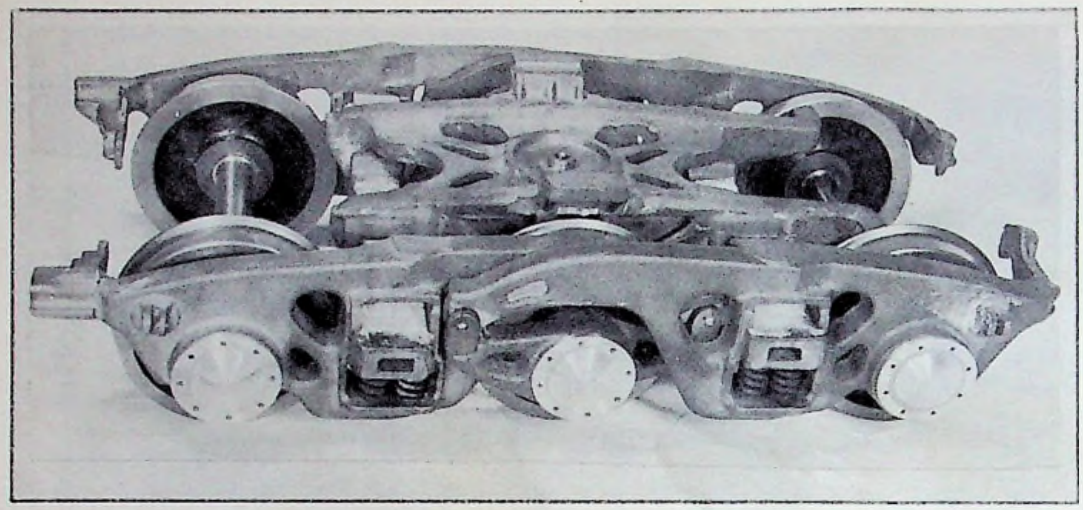
Drive Brake cylinder & heads, parts #BKE13-27, 28 & 29. Shown finished and assembled.



Coupler & knuckle Part #FME27-23 & 24. Shown finished and assembled.

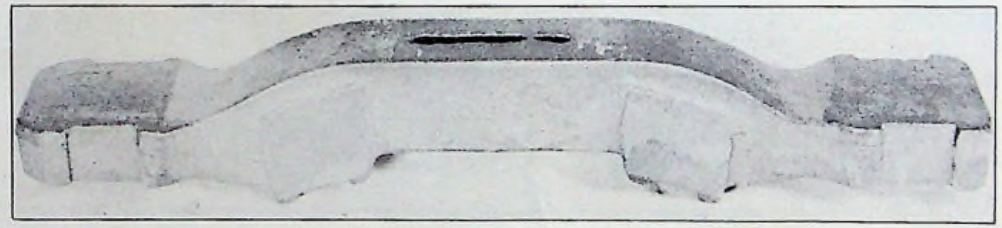


Two views of part #DRW5-1, axle housings & drive boxes. Shown machine finished.

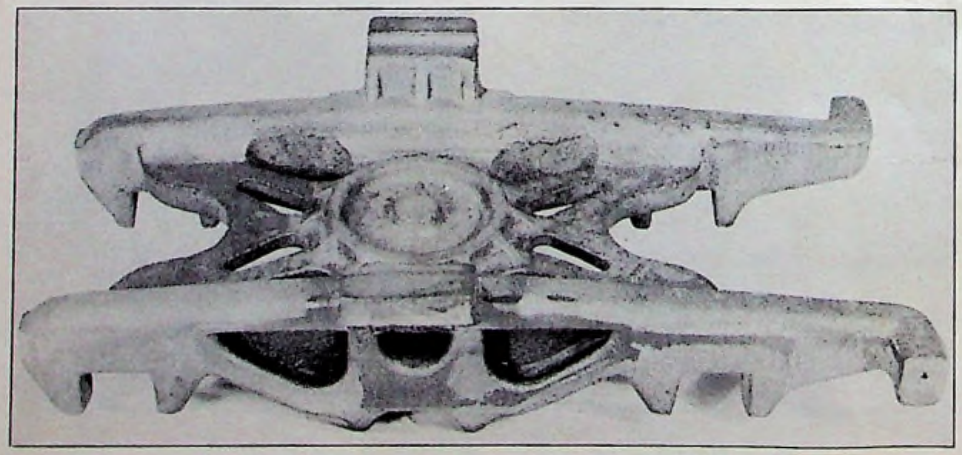


Buckeye tender truck shown machined and assembled.

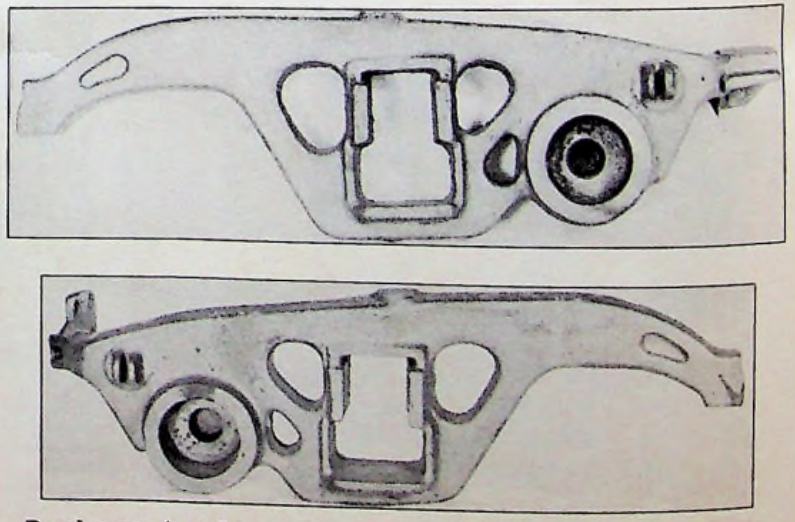
Buckeye tender truck part #BT-T38-3
Equalizer, shown in the rough.



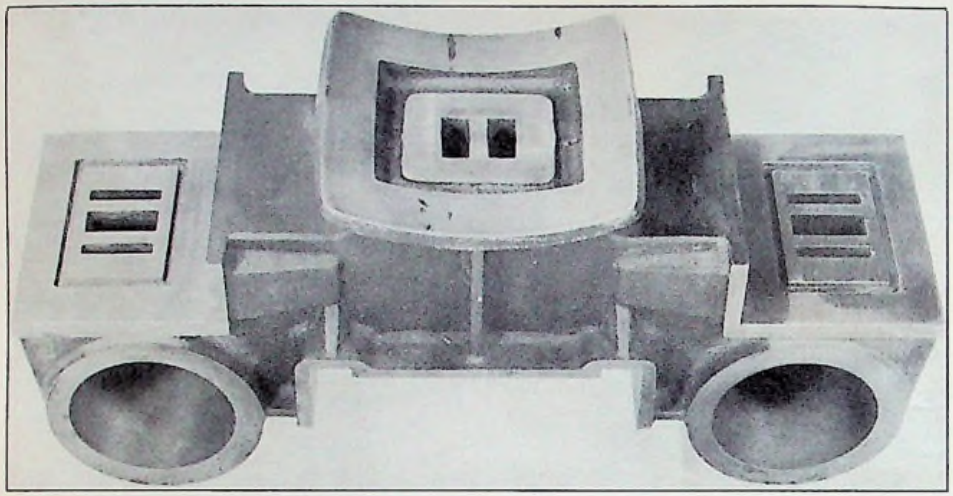
Buckeye tender truck part #BT-T38-5
Bolster, shown in rough casting.
(cast hollow)



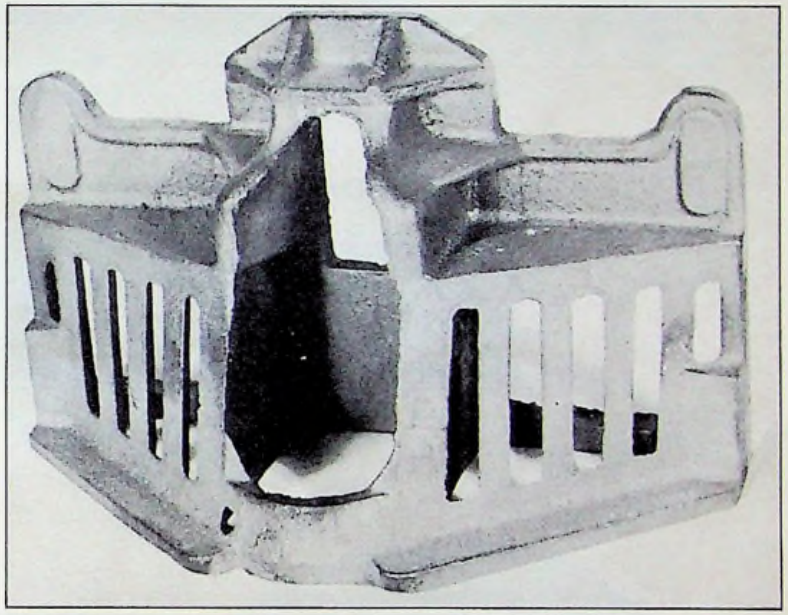
Buckeye tender truck part #BT-T38-1
Center Plate (rough casting)



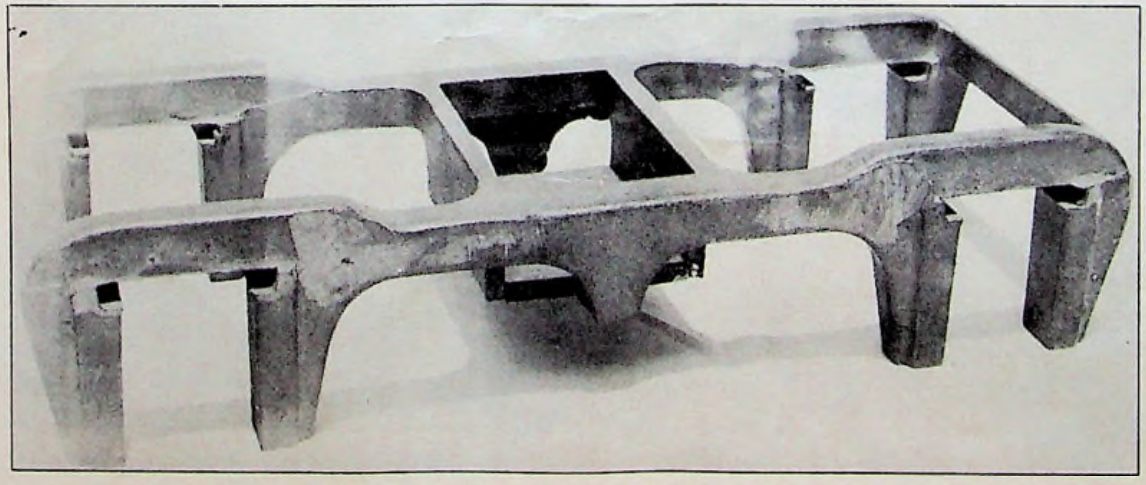
Buckeye tender truck parts #BT-T38-2, truck
frame (shown in the rough)



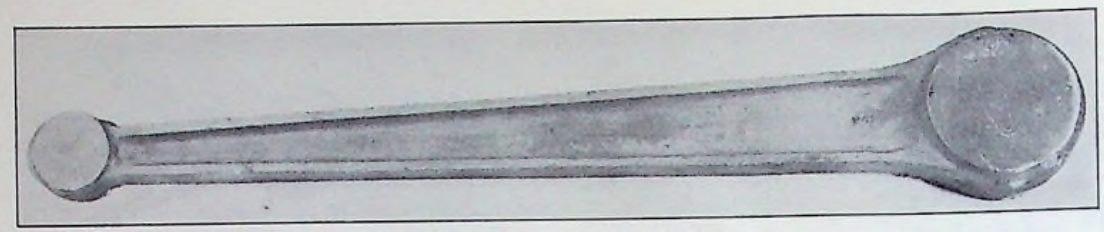
Cylinder block #CYL17-1, shown machined

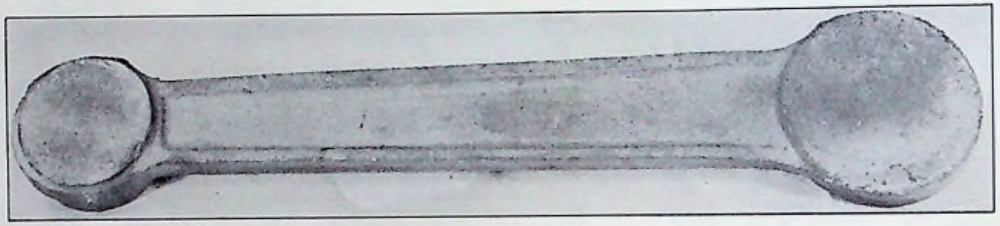


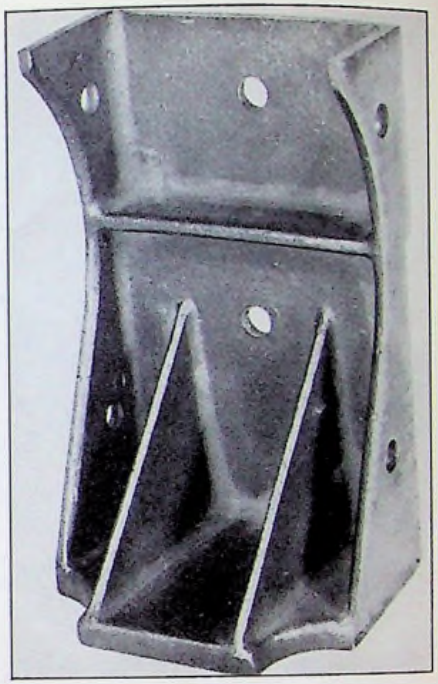
Pilot #FME27-21 shown rough casting.



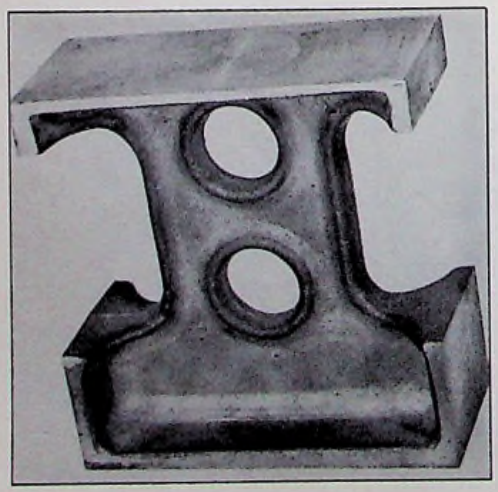
Leading truck #LDG16-1, cast in unit.
(Rough casting)



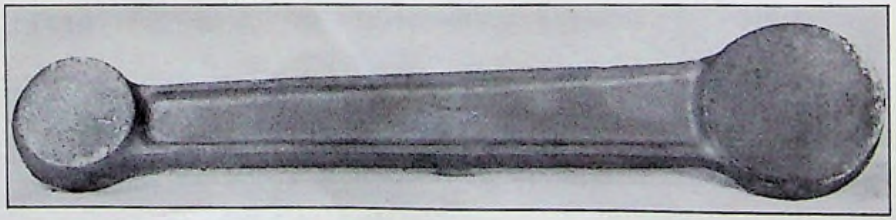


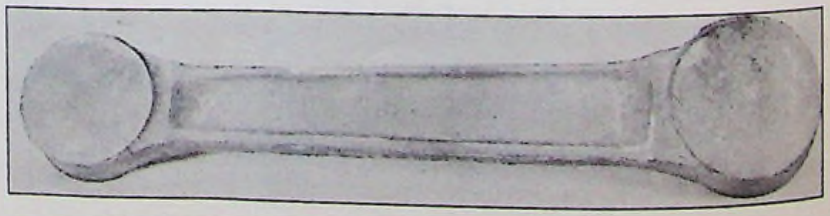


Frame spacer, front buffer
#FME11-1 (Shown finished)

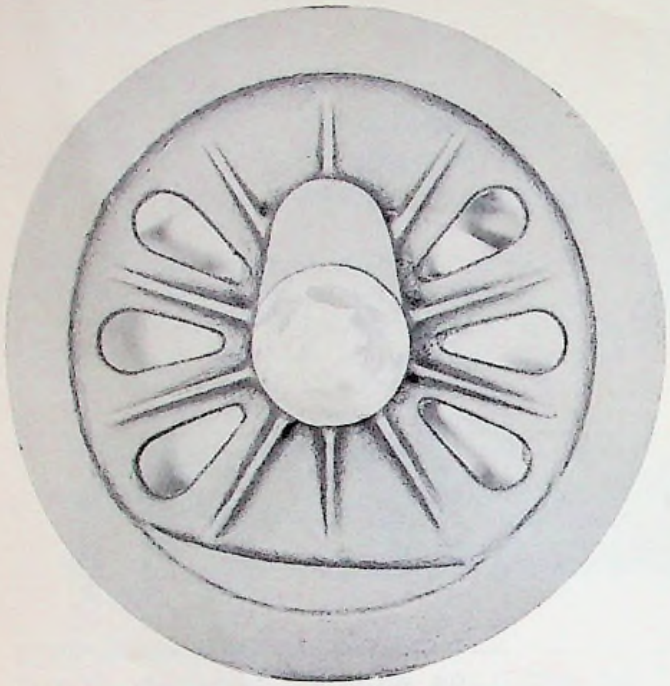


Main frame crosstie #FME2-1.
(Shown machined)

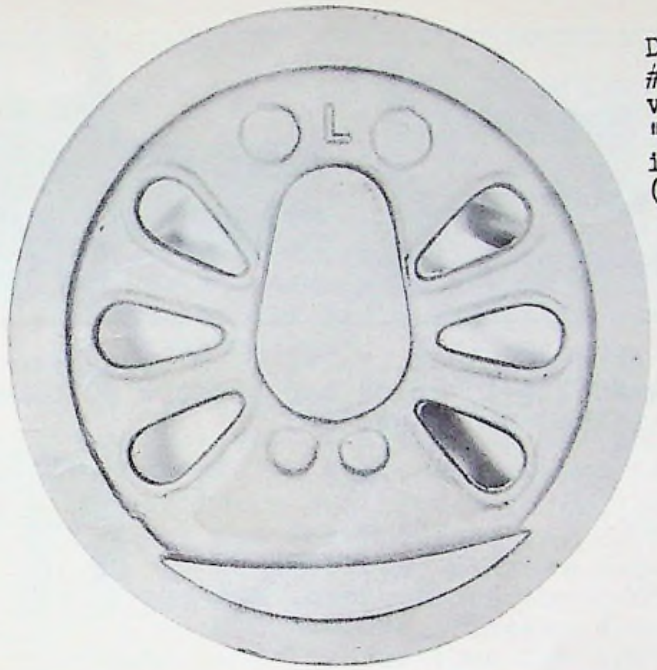




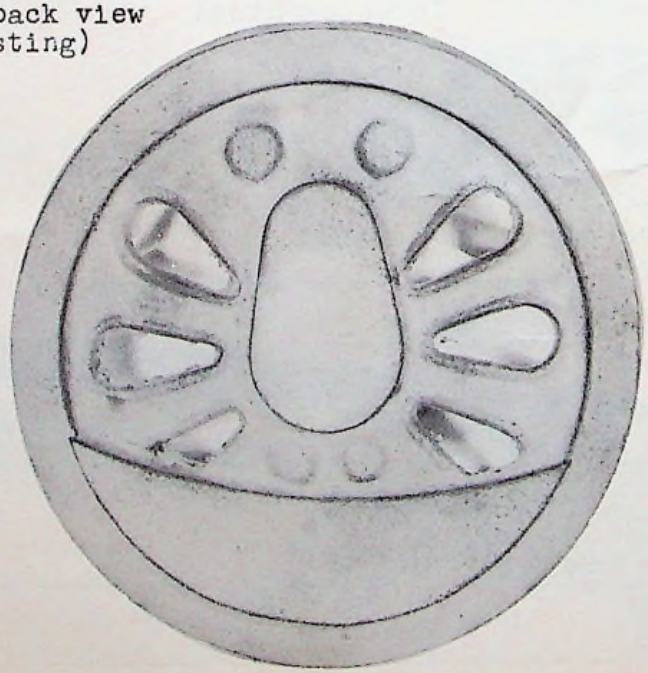
Main, side and intermediate rods.
#ROD22-1, 5, 18 and 9.
(Shown rough castings)



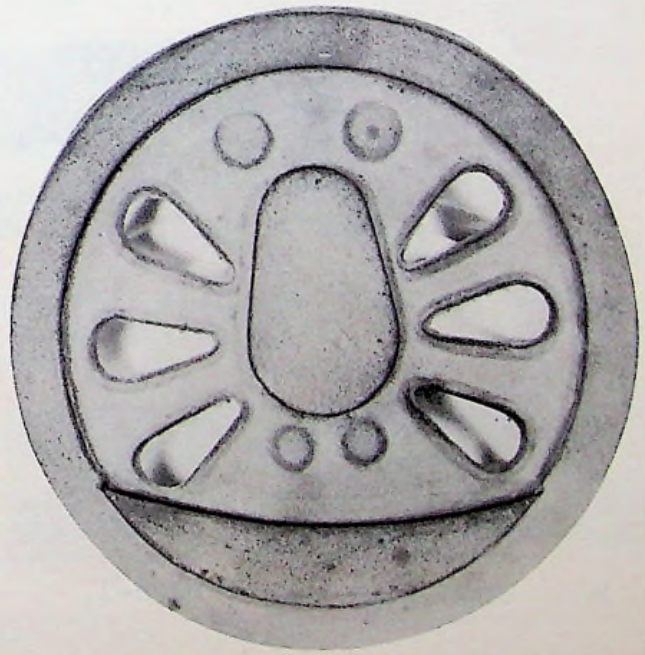
Drive wheel DRS7-1,back view
(Shown rough casting)



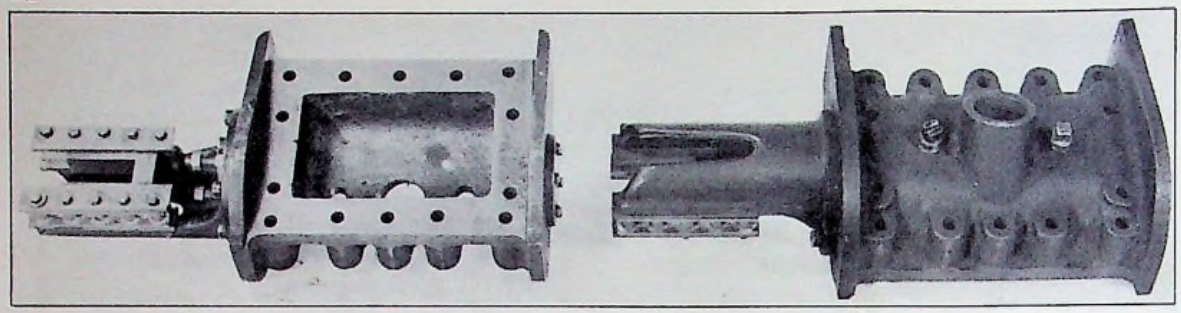
Drive wheel #DRS7-1,front view. Note "L", indicating Left Side (Rough casting shown)



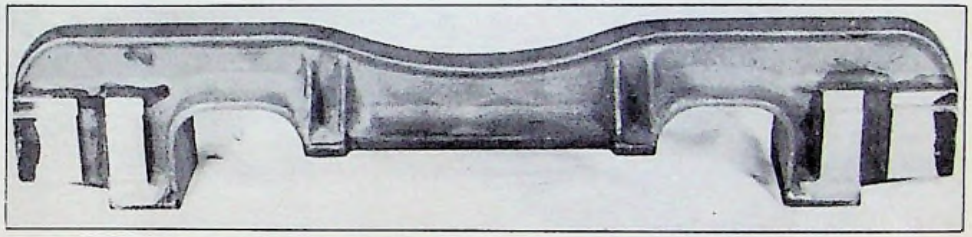
Drive wheel DRS7-1,rough casting.



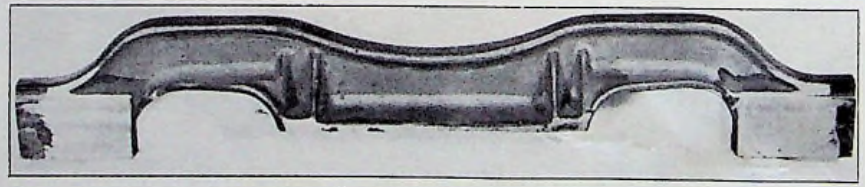
Drive wheel DRS7-1,rough casting.



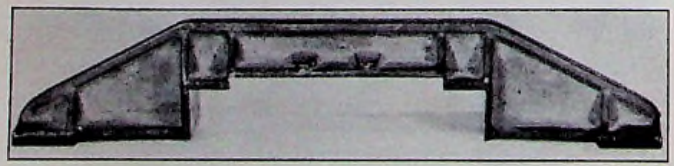
Steam chests #CYL18-1, valve stem crosshead guide brackets #CYL19-1, guide bar spacers #CYL19-2. Shown finished and assembled.



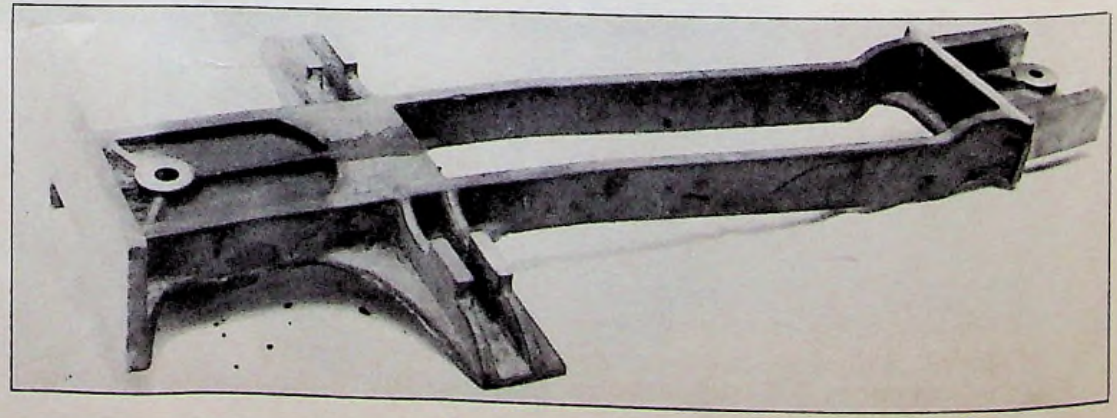
Main crosshead yoke and link support bracket #FME23-3. Shown machined.



Link girder support #FME24-1. Shown machine finished.



Main crosshead yoke #FME23-1.



Cradle #FME4-1.

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Write your name and address on the lines and mail this slip with $3.00 and we shall send you the book that you check off below:
(These are Martin S. Lewis' books)

1. Drawings and Instructions for 3/4" scale steam Locomotives, classes 4-6-4 & 4-8-4
2. Drawings and Instructions for 1/2" scale steam Locomotives, classes 4-6-2 & 4-8-2
3. Drawings and Instructions for 1/4" (O-gauge) Steam Locomotives, classes 4-6-4 & 4-8-4
4. STEAM DRIVEN FEED WATER PUMPS IN MINIATURE

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In each of these books Martin Lewis employs his "Step by Step" method of construction, which makes the work clear to the amateur builder.

Cut out Order Blank on this line which will keep Catalog intact.

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Martin S. Lewis' books are useful, and important to anyone interested in miniature steam engineering, because they are the result of many years' research and experimental work, and in them you are given the benefit of this experience by tried and proved methods. Each book covers much more ground than is indicated by the words "Drawings and Instructions". For instance, the valve gear Section of our 1/2" scale Drawings and Instructions contains complete information--in simple arithmetic that will enable anyone to design the Walschaerts valve gear for <u>any</u> scale locomotive.

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Drawings and Instructions for 1/4"(O-gauge) Steam Locomotives, classes 4-6-4 & 4-8-4...$3.00
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CIRCUMFERENCE AND AREAS OF CIRCLES

OF ONE INCH				OF INCHES OR FEET					
Fract.	Dec.	Circ.	Area	Dia	Circ.	Area	Dia.	Circ.	Area
1-64	.015625	.04909	.00019	1	3.1416	.7854	64	201.06	3216.99
1-32	.03125	.09818	.00077	2	6.2832	3.1416	65	204.20	3318.31
3-64	.046875	.14726	.00173	3	9.4248	7.0686	66	207.34	3421.19
1-16	.0625	.19635	.00307	4	12.5664	12.5664	67	210.49	3525.65
5-64	.078125	.24545	.00479	5	15.7080	19.635	68	213.63	3631.68
3-32	.09375	.29452	.00690	6	18.850	28.274	69	216.77	3739.28
7-64	.109375	.34363	.00939	7	21.991	38.485	70	219.91	3848.45
1-8	.125	.39270	.01227	8	25.133	50.266	71	223.05	3959.19
9-64	.140625	.44181	.01553	9	28.274	63.617	72	226.19	4071.50
5-32	.15625	.49087	.01917	10	31.416	78.540	73	229.34	4185.39
11-64	.171875	.53999	.02320	11	34.558	95.033	74	232.48	4300.84
3-16	.1875	.58905	.02761	12	37.699	113.1	75	235.62	4417.86
13-64	.203125	.63817	.03241	13	40.841	132.73	76	238.76	4536.46
7-32	.21875	.68722	.03758	14	43.982	153.94	77	241.90	4656.63
15-64	.234375	.73635	.04314	15	47.124	176.71	78	245.04	4778.36
1-4	.25	.78540	.04909	16	50.265	201.06	79	248.19	4901.67
17-64	.265625	.83453	.05542	17	53.407	226.98	80	251.33	5026.55
9-32	.28125	.88357	.06213	18	56.549	254.47	81	254.47	5153.
19-64	.296875	.93271	.06922	19	59.690	283.53	82	257.61	5281.02
5-16	.3125	.98175	.07670	20	62.832	314.16	83	260.75	5110.61
21-64	.328125	1.0309	.08456	21	65.973	346.36	84	263.89	5541.77
11-32	.34375	1.0799	.09281	22	69.115	380.13	85	267.04	5674.50
23-64	.359375	1.1291	.10144	23	72.257	415.48	86	270.18	5808.80
3-8	.375	1.1781	.11045	24	75.398	452.39	87	273.32	5944.68
25-64	.390615	1.2273	.11984	25	78.540	490.87	88	276.46	6082.12
13-32	.40625	1.2763	.12962	26	81.681	530.93	89	279.60	6221.14
27-64	.421875	1.3251	.13979	27	84.823	572.56	90	282.74	6361.73
7-16	.4375	1.3744	.15033	28	87.965	615.75	91	285.88	6503.88
29-64	.453125	1.4236	.16126	29	91.106	660.52	92	289.03	6647.61
15-32	.46875	1.4726	.17257	30	94.248	706.86	93	292.17	6792.91
31-64	.484375	1.5218	.18427	31	97.389	754.77	94	295.31	6939.78
1-2	.5	1.5708	.19635	32	100.53	804.25	95	298.45	7088.22
33-64	.515625	1.6199	.20880	33	103.67	855.30	96	301.59	7238.23
17-32	.53125	1.6690	.22166	34	106.81	907.92	97	304.73	7339.81
35-64	.546875	1.7181	.23489	35	109.96	962.11	98	307.88	7542.96
9-16	.5625	1.7671	.24850	36	113.10	1017.88	99	311.02	7697.69
37-64	.578125	1.8163	.26248	37	116.24	1075.21	100	314.16	7853.98
19-32	.59375	1.8653	.27688	38	119.38	1134.11	101	317.30	8011.85
39-64	.609375	1.9145	.29164	39	122.52	1194.59	102	320.44	8171.28
5-8	.625	1.9635	.30680	40	125.66	1256.64	103	323.58	8332.29
41-64	.640625	2.0127	.32232	41	128.81	1320.25	104	326.73	8494.87
21-32	.65625	2.0617	.33824	42	131.95	1385.44	105	329.87	8659.01
43-64	.671875	2.1108	.35453	43	135.09	1452.20	106	333.01	8824.73
11-16	.6875	2.1598	.37122	44	138.23	1520.53	107	336.15	8992.02
45-64	.703125	2.2090	.38828	45	141.37	1590.43	108	339.29	9160.88
23-32	.71875	2.2580	.40574	46	144.51	1661.90	109	342.43	9331.32
47-64	.734375	2.3072	.42356	47	147.65	1734.94	110	345.58	9503.32
3-4	.75	2.3562	.44179	48	150.80	1809.56	111	348.72	9676.89
49-64	.765625	2.4054	.45253	49	153.94	1885.74	112	351.86	9852.03
25-32	.78125	2.4544	.47937	50	157.08	1963.50	113	355	10028.75
51-64	.796875	2.5036	.49872	51	160.22	2042.82	114	358.14	10207.03
13-16	.8125	2.5525	.51849	52	163.36	2123.72	115	361.28	10386.89
53-64	.828125	2.6017	.53862	53	166.50	2206.18	116	364.42	10568.32
27-32	.84375	2.6507	.55914	54	169.65	2290.22	117	367.57	10751.32
55-64	.859375	2.6999	.58003	55	172.79	2375.83	118	370.71	10935.88
7-8	.875	2.7489	.60132	56	175.93	2463.01	119	373.85	11122.02
57-64	.890625	2.7981	.62298	57	178.07	2551.76	120	376.99	11309.73
29-32	.90625	2.8471	.64504	58	182.21	2642.08	121	380.13	11499.01
59-64	.921875	2.8963	.66746	59	185.35	2733.97	122	383.27	11689.87
15-16	.9375	2.9452	.69029	60	188.50	2827.43	123	386.42	11882.29
61-64	.953125	2.9945	.71349	61	191.64	2922.47	124	389.56	12076.28
31-32	.96875	3.0434	.73708	62	194.78	3019.07	125	392.70	12271.85
63-64	.984375	3.0928	.76097	63	197.92	3117.25	126	395.84	12468.98

TABLE OF STANDARD THREADS

Note:—The National Screw Thread commission has established thread systems for general use. The United States Standard thread is termed National Course (N. C.) and the S. A. E. also A. S. M. E. series is termed National Fine (N. F.) This marking (N. C.) and (N. F.) will be marked on all taps and dies in the future.

N. F. STANDARD—U. S. Form Thread

A—Nominal size, diameter, inch; B—Outside (body) diameter, inch; C—Pitch diameter, inch; D—Root diameter, inch; E—Tap drill to produce approximately 75% full thread; F—Tap drill, decimal inch.

Size (A)	B	C	D	E	F
0-80	.0600	.0519	.0438	3/64	.0469
1-56	.0730	.0614	.0498	54	.0550
64	.0730	.0629	.0527	53	.0595
72	.0730	.0640	.0550	53	.0595
2-56	.0860	.0744	.0628	50	.0700
64	.0860	.0759	.0657	50	.0700
3-48	.0990	.0855	.0719	47	.0785
56	.0990	.0874	.0758	45	.0820
4-32	.1120	.0917	.0714	45	.0820
36	.1120	.0940	.0759	44	.0850
40	.1120	.0958	.0795	43	.0890
48	.1120	.0985	.0849	42	.0935
5-36	.1250	.1078	.0889	40	.0980
40	.1250	.1088	.0925	38	.1015
44	.1250	.1102	.0955	37	.1040
6-32	.1380	.1177	.0974	36	.1065
36	.1380	.1200	.1019	34	.1110
40	.1380	.1218	.1055	33	.1130
7-30	.1510	.1294	.1077	31	.1200
32	.1510	.1307	.1104	31	.1200
36	.1510	.1330	.1149	1/8	.1250
8-30	.1640	.1423	.1207	30	.1285
32	.1640	.1437	.1234	29	.1360
36	.1640	.1460	.1279	29	.1360
40	.1640	.1478	.1315	28	.1405
9-24	.1770	.1499	.1229	29	.1360
30	.1770	.1553	.1337	27	.1440
32	.1770	.1567	.1364	26	.1470
10-24	.1900	.1629	.1359	25	.1495
28	.1900	.1668	.1436	23	.1540
30	.1900	.1684	.1467	22	.1570
32	.1900	.1697	.1494	21	.1590
12-24	.2160	.1889	.1619	16	.1770
28	.2160	.1928	.1696	14	.1820
32	.2160	.1957	.1754	13	.1850
14-20	.2420	.2095	.1770	10	.1935
24	.2420	.2149	.1879	7	.2010
16-18	.2680	.2319	.1966	3	.2130
20	.2680	.2355	.2030	7/32	.2187
22	.2680	.2385	.2090	2	.2210
18-18	.2940	.2579	.2218	B	.2380
20	.2940	.2615	.2290	D	.2460
20-16	.3200	.2794	.2388	G	.2610
18	.3200	.2839	2.478	17/64	.2656
20	.3200	.2875	.2550	1	.2720
22-16	.3460	.3054	.2648	9/32	.2812
18	.3460	.3099	.2738	L	.2900
24-16	.3720	.3314	.2908	5/16	.3125
18	.3720	.3359	.2998	O	.3160
26-14	.3980	.3516	.3052	21/64	.3281
16	.3980	.3574	.3168	R	.3390
28-14	.4240	.3776	.3312	T	.3580
16	.4240	.3834	.3428	23/64	.3594
30-14	.4500	.4036	.3572	V	.3770
16	.4500	.4094	.3688	25/64	.3906


Wm. C. Vaeth, N.Y., 1/4" scale
4348
Marcel Mussa, Calif
3/4",
Roy B. Stewart, Tenn. 3/4
MISSOURI PACIFIC LINES
2116
R. Wilkerson, Kansas 3/4
A. Swaney, Texas 3/4"
O. J. Hansen, Calif. 1/4"