

the equalizers should have bearings sufficiently far apart to give lateral stability.

On 262 and 282 type engines, the leading truck and first and second pair of drivers should be equalized together instead of the leading truck and first pair of drivers only.

8. When WEAR PLATES between spring hangers and frames are specified, use as per Standard Drawings, (see Index).
9. Provide two-pin bearing in the central portion of front TRANSVERSE EQUALIZER on all types of engines without leading truck.
10. Because ARTICULATED locomotives have very long driving wheel bases with frames of rear and front engines held in substantially the same horizontal plane, provide sufficient flexibility in driving springs to permit the wheels to adjust themselves in passing over summits or through sags and other inequalities in track levels.
When small driving wheels are used in combination with firebox over drivers which do not permit springs on rear engine to be located over the wheels, then greater flexibility in spring arrangement should be provided. In this connection, consider the following:
 - (a) Auxiliary coil springs front end of half-elliptic spring at first driver rear engine and back end of front engine.
 - (b) If trailing truck has inside bearings: Box equalizer containing half-elliptic springs for connection between rear driver and trailing truck, or half-elliptic, instead of coil springs over truck boxes.
11. For material for EQUALIZERS, see Group 99¹. When necessary to use cast steel equalizers, the castings must be thoroughly annealed and free from defects and maximum fibre stress must not exceed 8,000 pounds.
Bush all PIN HOLES in equalizers, using case-hardened bushings of standard sizes. Apply dowels in pins at lower end of spring hanger links to prevent pins turning in link bosses.
Omit OIL HOLES from all equalizers and spring hangers.
12. Forgings for all SPRING HANGER PINS, whether hex. or round head, to be made with hex. head of standard size. Corners of hex. will be machined off when round head is required on finished pin.
13. Use DRIVING BOX SADDLES seating springs on rollers and drop type equalizers. See Group 16 - Driving box saddle CLEARANCE.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co's. drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

78 S 2296 a

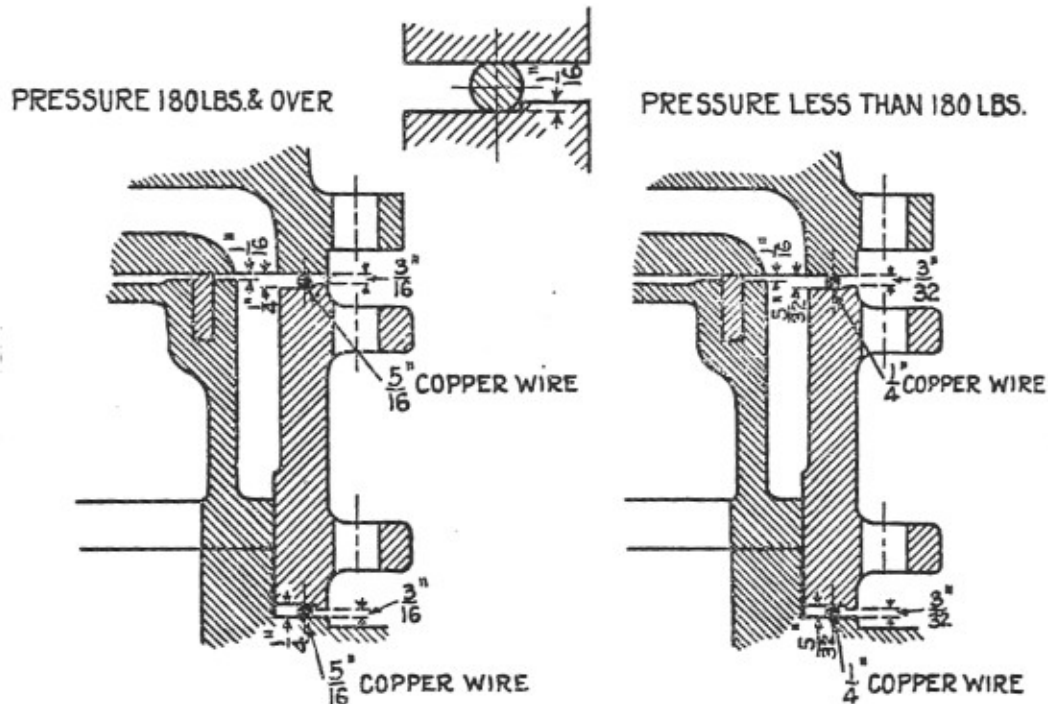
October 15th, 1925

STEAM CHEST.

Superseding
78 S 2296

APPROVED
ENGINEERING
COMMITTEE

1. **Slide Valve Balance Plates:** Cast solid with Steam Chest Covers.
Clearance between top of valve and balance plate to be $\frac{1}{16}$ " after cover is tightened down. See sketch below.



2. **Slide Valve Steam Chest Joints:** Make of $\frac{5}{16}$ " copper wire for 180 pounds boiler pressure and over, $\frac{1}{4}$ " copper wire for less than 180 pounds and small engines.
3. **Piston Valve Steam Chest Covers:** Use $\frac{1}{8}$ " fillet in flange corner and chamfer bore $\frac{3}{16}$ " x $\frac{3}{16}$ ".
4. **Valve Stem Packing.**—See Group 65.
5. **Steam Chest Cover and Valve Rod Crosshead Guide:** Provide boss on gibs and apply set screws in outside guide right and left, as shown on card 942 S 63650.
6. **Self-Centering Valve Rod Crosshead Guide:** Use the following materials:

DIAMETER OF VALVE	DISTANCE FROM CENTER OF GUIDE TO GRINDING FACE OF HEAD	GUIDE MATERIAL
Under 14"	20" and under	Cast Iron
	Over 20"	Cast Steel
14" & over	Under 22"	Cast Iron
	22" and over	Cast Steel

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

79 S 2297 b

July 27th, 1925

STEAM GAUGES, SAFETY VALVES AND TURRETS.

Superseding
79 S 2297 a

APPROVED
ENGINEERING
COMMITTEE

- STEAM GAUGES:** Use Iron-Case gauges on all locomotives. Bend pipe connecting Gauge with boiler, in a circle, forming a water trap to prevent steam entering tubes of gauge, and so located that water in trap will stand below bottom of Gauge. Arrangement per Standard drawings (see Index).
Order gauge cock, fittings and pipe union separately, to Standard drawings (see Index), in material book. Specify on orders for gauges that these parts are to be omitted.
- STEAM GAUGE GRADUATIONS:** Specify the following, using pounds per square inch:

BOILER PRESSURE		MAX. GRADUATION	
LB. PER SQ. IN.	KGM. PER SQ. CM.	LB. PER SQ. IN.	KGM. PER SQ. CM.
150 to 180	10.5 to 12.7	300	25
185 to 220	13.0 to 15.5	400	30
225 to 250	15.8 to 17.6	500	35

NOTE: Figures in last two columns are not equivalent.

When gauges are specified to be graduated in atmospheres, raise question with Ry. Co. as to whether one atmosphere is to be considered equal to:

- 14.7 pounds per sq. in.
- 14.22 " " " " = 1 kilogram per sq. centimeter. (This represents the prevailing foreign practice.)

If (a), make entry in material book as follows:

"Graduate gauge in atmospheres. Put note on dial: '1 Atm. = 14.7 lb. per sq. in.' and make graduations to correspond. Zero reading at atmospheric pressure."

If (b), endeavor to obtain permission to graduate gauge in kilograms per sq. centimeter, and in case this is not granted, make entry in material book as follows:

"Graduate gauge in atmospheres. Put note on dial: '1 Atm. = 1 Kgm. per sq. cm.', and make graduations to correspond. Zero reading at atmospheric pressure."

Cross-Indexed in Group 48.

- RECEIVER GAUGE:** Provide on all Articulated compound locomotives, 5' iron-case Gauge graduated to 150 lb., similar to Ashcroft type, "DP." Mark dial with red line at 30% of boiler pressure. Locate on steam gauge stand in cab and connect to receiver cavity in high pressure cylinders. Use gauge fitting with $\frac{1}{16}$ " choke, to Standard drawing (see Index).
- SHOP TEST GAUGE:** For Steam and Water Tests, use special Gauges (plainly marked "Shop Test" on face) and apply the new gauges belonging to the locomotives, after tests are completed. Do not use new Gauges belonging to locomotives, for Shop Tests. Test Shop Gauges at frequent intervals to insure their accuracy.
- SAFETY VALVE SETTING:** Locate fitting for gauge used in setting (per Standard drawing, see Index), in boiler roof as near center as possible, over firebox tube sheet and immediately ahead of first row of radial stays.
- SAFETY VALVE ARRANGEMENT:** Where clearance limit will permit and satisfactory height of dome can be obtained, attach safety valves to dome cap, otherwise directly to roof of boiler.
Use turret only when specified. Make of cast steel per Standard drawing (see Index) and use studs at least 1" in diameter, spaced not more than $3\frac{1}{2}$ " centers in cap and with fiber stress not exceeding 6500 lb. calculated on load obtained from mean diameter of wire gasket. Make area of turret inlet not less than the sum of the areas of all safety valves in turret as per table below:

MINIMUM DIAM. OF TURRET INLET				
NO. OF VALVES	VALVE DIAMETER			
	2½"	3"	3½"	4"
2	3¾"	4¾"	5"	5¾"
3	4½"	5½"	6¼"	7"

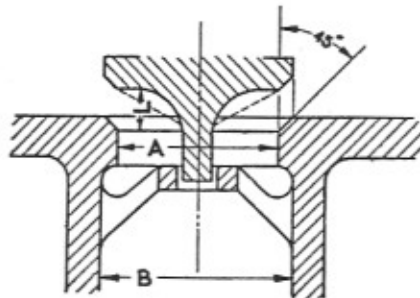
Use brass extensions per Standard drawings (see Index), except for Safety Valves having threaded shanks.

(OVER)

7. **CAB TURRET:** Make of cast steel for steam pressures over 180 lb. and for all pressures with cylinders over 20" diameter.

Internal area of dry pipe, area of passage from dry pipe to shut-off valve, or area of opening through valve with full lift, must not be less than the sum of the internal areas of all pipes leading from turret which use steam continuously and at the same time. Omit drain hole from dry pipe and connecting elbows. Use table of pipe areas below.

Use form of shut-off valve shown below (instead of form shown by dotted lines). Lift of valve must not be less than that given in table.



DRY PIPE SIZE	A	B	L MIN.
2 "	2 "	2½"	9/16"
2½"	2½"	3 "	5/8"
3 "	3½"	4 "	3/4"
½"	4 "	4½"	13/16"

TURRET DRY PIPE	
IRON PIPE SIZE	INTERNAL AREA □"
2 "	3.36
2½"	4.78
3 "	7.38
3½"	9.89

CONNECTIONS								
IRON PIPE				COPPER PIPE				
SIZE	INTERNAL AREA □"		O. S. DIA.	THICKNESS B. W. G.	INTERNAL AREA □"	O. S. DIA.	THICKNESS B. W. G.	INTERNAL AREA □"
	ORDINARY	EX. STRONG						
¾"	0.53	0.43	¾"	No. 13	0.25	2 "	No. 11	2.43
1 "	0.86	0.71	13/16"	" 13	0.30	2¼"	" 11	3.17
1¼"	1.50	1.27	7/8"	" 13	0.37	2½"	" 10	3.91
1½"	2.04	1.75	1 "	" 12	0.48	2¾"	" 10	4.83
2 "	3.36	2.94	1¼"	" 12	0.84	3 "	" 10	5.85
2½"	4.78	4.21	1½"	" 12	1.29	3¼"	" 9	6.83
3 "	7.38	6.57	1¾"	" 11	1.79	3½"	" 9	8.04

Cross-Indexed in Groups 63 & 64.

QUESTION: Duplicate engines,

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

82 S 2299 a

May 27th, 1925

TANK VALVES AND COCKS.

Superseding
82 S 2299

APPROVED
ENGINEERING
COMMITTEE

Tank Hose: Use same size on both sides of tender.

Outside surface to be corrugated and with wire interwoven; inside to be smooth bore.

Ends to be smooth for $3\frac{1}{2}$ inches.

Diameters to suit proper size feed pipe required for different sizes and makes of injectors.

FEED PIPE	HOSE	
	Inside Diam.	Length
$1\frac{1}{2}$ "	$2\frac{1}{4}$ "	48"
2"	$2\frac{1}{2}$ "	48"
$2\frac{1}{2}$ "	3"	48"
3"	$3\frac{1}{2}$ "	54"
$3\frac{1}{2}$ "	4"	54"
4"	$4\frac{1}{2}$ "	60"

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

84 S 2300b

April 11th, 1928

TENDER BRAKES

Superseding
84 S 2300a

APPROVED
ENGINEERING
COMMITTEE

1. **Tender Brake Beams:** Use beams of approved design and manufacture with deflection at center preferably not more than $\frac{1}{16}$ " (maximum 0.07") under the "deflection load" given in table, which is based on braking power and maximum cylinder pressure. In addition, the beam when loaded with a "set load" and released to 500 lb., must not show a set greater than 0.01 in. Rigid Brake Heads are preferred.
Order beams as follows:

"Deflection at center under (deflection load) _____ lb. load, preferably not over $\frac{1}{16}$ " (maximum 0.07 in.).
When loaded to (set load) _____ lb. and released to 500 lb., the beam must not show a set greater than 0.01 in."

MINIMUM CAPACITY OF BRAKE BEAMS (4 Per Tender)				
LIGHT WEIGHT OF TENDER IN POUNDS		A. R. A. BEAM NO.	DEFLECTION LOAD	SET LOAD
PASSENGER SERVICE	FRT. & SWITCHER SERVICE			
30000	34000	1 Plus	8500	18000
39000	48000	2	12000	24000
	60000	2 Plus	15000	27000
47000	72000	3	18000	30000
62000	96000	4	24000	36000
73000		5	28000	39200
94000		6	36000	48000

2. **Tender Brake Rigging:** Design in accordance with the following, limiting stresses to suit A. R. A. Recommended Practice, and basing load on maximum cylinder pressure corresponding to operating schedule used:

A. R. A. RECOMMENDED PRACTICE (1925)		
PART	STRESS	
	KIND	MAXIMUM
Levers	Bending	23000
*Rods (except jaws)	Tensile	15000
Rod Jaws	"	10000
Pins	Shear	10000
"	Bearing	23000

*Minimum diameter of rods $\frac{7}{8}$ ".

BRAKE SCHEDULE		SERVICE	MAX. CYL. PRESSURE LBS. PER SQ. IN.
WESTINGHOUSE	N. Y.		
No. 6 ET	LT	Passenger	95
No. 6 ET	LT	Freight & Switcher	70
HK & PK	TQ	All	60
FL	T	All	50

3. See Group 19.—Tender Brake cylinder sizes.
4. See Group 56.—Laws, Rules and Instructions, I. C. C. Public Service Commission, &c.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

85 S 2301c

September 14th, 1927

TENDER FRAMES

Superseding
85 S 2301b

APPROVED
ENGINEERING
COMMITTEE

1. **FRAME DESIGN:** Use steel channel frames for all tenders, in accordance with limits of weight and tractive force of engine given below:

FRAME CHANNEL	LIMITATIONS		TANK		FRAME DRAWING	TRUCK
	TOTAL WEIGHT OF ENGINE-LB.	MAX. TRACTIVE FORCE-LB.	WIDTH INSIDE	LENGTH INSIDE		
10'	100000 and under	30000 and under	112' and 116'	18'-0" 20'-0" 22'-0"	858 A 2110 858 A 2111 858 A 2112	4½' x 8'
10'	Over 100000 to 160000	Over 30000 to 40000	116' and 118'	20'-0" 22'-0" 24'-0"	858 A 2114 858 A 2115 858 A 2116	5' x 9'
13' Light	Over 160000 to 230000	Over 40000 to 50000	118' and 120'	20'-0" 22'-0" 24'-0" 26'-0"	858 A 2120 858 A 2121 858 A 2122 858 A 2123	5' x 9' 5½' x 10'
13' Heavy	Over 230000 & under 300000	Over 50000 & under 60000	120'	24'-0" 26'-0"	858 A 2130 858 A 2131	5½' x 10'
13' Reinforced	300000 and over	60000 and over	120'	26'-0" 28'-0" 30'-0"	859 S 21890 859 S 21891 859 S 21892	6' x 11'

A complete list of detail pattern and drawing numbers is given on each frame drawing.

2. **SIDE BEARINGS.** Use the following spacing and clearance. Cross-indexed in Group 89.

TYPE OF TRUCK	SPACING	CLEARANCE
4-wheel	50"	¾"
6-wheel	52"	¾"

3. **Truck Centers.** Submit all new and preliminary designs to Calculating Department for determination of center of gravity (with full load of fuel and water), and locate trucks equally distant from this center.
4. **Foreign Locomotives.** See Group 48.
5. **Push Pole Pockets:** See Group 21.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

86 S 2302 b

April 28th, 1931

TENDER DRAW-GEAR

Superseding
86 S 2302 a

APPROVED
ENGINEERING
COMMITTEE

1. Draw-Gear at rear of tender: Use per Standard Drawings (see Index), as follows:

SERVICE:	MAX. TRACTIVE FORCE (INCLUDING ENGINE TENDER BOOSTERS)	DRAW-GEAR, REAR	
		TYPE	DRAWING No.
Switching	35000 & under	Short Shank Coupler and Pocket Casting	863 A 2440
	Over 35000 to 42000	A. L. Co. Twin Spring	863 A 2460
	42000 & over	Friction	-
Freight	30000 & under	Short Shank Coupler and Pocket Casting	863 A 2440
	Over 30000 to 42000	A. L. Co. Twin Spring	863 A 2460
	42000 & over	Friction	-
Passenger	25000 & under	Short Shank Coupler and Pocket Casting	863 A 2440
	Over 25000 to 30000	A. L. Co. Twin Spring	863 A 2450
	Over 30000 to 35000	" " " " "	863 A 2460
	35000 & over	Friction	-

Raise question with V. P. Eng. when Ry. Co.'s. Specifications exceed the above limits.

2. Buffer between engine and tender.—See Group 47.
3. Buffer at rear of tender: Omit.
4. See Group 15.—Double Nuts on Draw Castings.
5. See Group 48.—Foreign Locomotives.
6. See Group 56.—Laws, Rules and Instructions, I. C. C., Public Service Commission, &c.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

87 S 2327

June 22nd, 1917

TENDER STEPS, ETC.

Superseding

APPROVED
ENGINEERING
COMMITTEE

See Group 56.—Laws, Rules and Instructions, I. C. C., Public Service Commission, &c.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

88 S 2303 a

October 26th, 1926

TENDER TANKS

Superseding
88 S 2303

APPROVED
ENGINEERING
COMMITTEE

1. **Dimensions (inside plates):** Use as follows; length varying by 12 inches from 16 feet to 18 feet and by 24 inches over 18 feet:

LENGTHS	WIDTHS
16'-0"	100"
17'-0"	104"
18'-0"	108"
20'-0"	112"
22'-0"	116"
24'-0"	118"
26'-0"	120"

Preferred Sizes in Heavy-face Type.

NOTE: Only where deviation from the above lengths is absolutely necessary on account of limitations of wheel base, may intermediate lengths of 19'-0", 21'-0", 23'-0" and 25'-0" be used.

2. **Coal Gate Location:** Distance from center of opening in fire door frame to tank coal gate must not be less than 6 feet nor more than 6 feet 6 inches, except engines equipped with stoker, on which coal gate must be located in accordance with stoker company's instructions, subject to approval of R. R. Company.
3. **Tank Collar:** Use $1\frac{1}{2}$ " x $\frac{7}{16}$ " half-oval beading.
Stiffen tank collar in coal space by angle riveted to inside by rivets through beading.
Size of angles as follows:
Coal space length, under 10 feet..... $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x $\frac{3}{8}$ "
" " " " 10 " and over..... 3 " x $2\frac{1}{2}$ " x $\frac{3}{8}$ "
When collar back of coal board is over 10' wide for length of 4 feet or over apply stiffening angle of same size as that used in coal space.
4. **Vanderbilt Tanks:** Use rivets instead of bolts to secure swash plates to supporting tee irons. Arrange connection between coal and water spaces as shown on Card 880 S 95420.
5. **Tank Bracing:** Extend vertical tees and off-set lower ends to overlap bottom angle.
6. **Gravity Slides:** Use on tanks where engines are equipped with stoker.
7. **Tank Seams:** For tank plates $\frac{5}{16}$ " thick and under, use $\frac{1}{2}$ " rivets, $1\frac{3}{4}$ " spacing; for tank plates over $\frac{5}{16}$ ", use $\frac{5}{8}$ " rivets, $2\frac{1}{8}$ " spacing. Tar paper to be used in seams for both water and oil tanks. Water tank seam not calked. Oil tank seam calked. On tank drawings show countersunk rivets in portions of bottom transverse seams which cross tender floor angles or steel bumpers.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

89 S 2304 a

May 25th, 1925

TENDER TRUCKS

Superseding
89 S 2304

APPROVED
ENGINEERING
COMMITTEE

1. Standard Tender Trucks: Use the following:

TITLE	JOURNAL					
	3¾" x 7"	4¼" x 8"	5" x 9"	5½" x 10"	6" x 11"	6½" x 12"
Truck Arrangement.....	893 A 1100-3	893 A 1070-3	893 A 1080-8	893 A 1090-8		
Brake " (L. Sec. Bolster)	843 A 3000-8	843 A 3000-8	843 A 3010-8	843 A 3020-8		
" " (Chan. " ")	843 A 3030-8	843 A 3030-8	843 A 3040-8	843 A 3050-8		
Axle	112 S 5600	112 S 5610	112 S 5620	112 S 5630	112 S 5640	112 S 5680
Bearing	172 S 60850	172 S 60860	172 S 60870	172 S 60880	172 S 60890	172 S 60900
Box Wedge.....	172 S 60910	172 S 60920	172 S 60930	172 S 60940	172 S 60950	172 S 60960
Bolster Outline.....	893 A 4060	893 A 4060	893 A 4061	893 A 4062		
" Guide	893 A 5070	893 A 5070	893 A 5080	893 A 5080		
Spring Plank			893 A 7070-1 & 4	893 A 7072-3 & 5		
Seat.....	893 A 7081	893 A 7081	893 A 7100-3	893 A 7100-3		
" Ellip., Sectional (Pref.)	762 A 5110-3	762 A 5110-3	762 A 5115-8	762 A 5115-8		
" " Scroll Ends.....	762 A 5160-3	762 A 5160-3	762 A 5165-8	762 A 5165-8		
" Coil (Assembled).....	762 A 5130	762 A 5130	762 A 5140-1	762 A 5141-2		

- Springs:** Use elliptic tender truck springs for all road locomotives and helical (coil) tender truck springs for all switchers.
- Clearance** between top of bolster and arch bar 1¼" on standard trucks. On trucks other than standard, this clearance must not be less than the calculated deflection of the spring expressed in the next higher multiple of ¼".
- See **Group 11.**—Tender Truck Axles.
- See **Group 17.**—Tender Truck Box Bolts.
- See **Group 48.**—Foreign Locomotives.
- See **Group 56.**—Laws, Rules and Instructions.
- See **Group 76.**—Tender Truck Springs.
- See **Group 85.**—Tender Truck Side Bearings.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

91 S 2305 d

July 10th, 1928

THROTTLE AND DRY PIPE

Superseding
91 S 2305 c

APPROVED
ENGINEERING
COMMITTEE

1. Throttle Valves, Stand Pipes and Elbows should be proportioned to give not less than full area of dry pipes, whether steam passing through throttle is saturated or superheated. Use Throttle with straight pipe and top-lift valve, and make depth of valve seats $\frac{1}{4}$ " on all throttles with dry pipes 7" diameter and over. Use the following working allowances on valve ribs and discs, making bore in throttle below both valve seats to full dimensions:

DRY PIPE OUTSIDE DIAMETER	DIAMETER	
	OVER RIBS	OVER DISC
Under 8"	$\frac{1}{32}$ "	$\frac{1}{64}$ "
8" & over	$\frac{1}{32}$ "	$\frac{1}{32}$ "

2. Dry Pipes: Use lap-welded black pipe of open hearth or Bessemer steel. Use loose ball joint ring between pipe and superheater header, with flat seat on header. Use offset pipes only where absolutely necessary. Determine size as follows, using the larger of the sizes required by either cylinder diameter or number of superheater units. Cylinder diameter in each case is maximum for corresponding diameter of pipe.

CYLINDER DIAMETER					DRY PIPE					
SIMPLE			COMPOUND		NOMINAL DIAMETER IN.	ACTUAL			MAXIMUM PRESSURE	
TWO CYL. INCHES	THREE CYL. INCHES	FOUR CYL. ART. INCHES	H. P. CF ART. INCHES	H. P. OF C. C. INCHES		I. D. IN.	O. D. IN.	THICKNESS INCHES	INT.	EXT.
14-15.5			14-15	14.5-16	5 O. D.	4.500	5.000	.2500	900	590
18	13-14.5		17	20	5 I. D.	5.047	5.563	.2580	835	525
21	17	13.5-15	20	23	6 I. D.	6.065	6.625	.2800	760	455
25	20.5	18	24	27	8 O. D.	7.500	8.000	.2500	560	260
					8 O. D.	7.375	8.000	.3125	700	400
28	23.5	20	27.5		8 I. D.	8.071	8.625	.2770	575	280
					8 I. D.	7.981	8.625	.3220	670	370
					9 O. D.	8.500	9.000	.2500	500	205
29	25	21			9 O. D.	8.375	9.000	.3125	625	325
					10 O. D.	9.375	10.00	.3125	560	260
32	27	23	31		10 O. D.	9.250	10.00	.3750	675	370
					10 I. D.	10.136	10.75	.3070	510	215
36	29	25	34		10 I. D.	10.020	10.75	.3650	610	310
					11 O. D.	10.125	11.00	.4375	715	410
		28			12 I. D.	12.000	12.75	.3750	530	230
					12 I. D.	11.750	12.75	.5000	705	400

NO. OF SUPHT'R UNITS	DRY PIPE DIAMETER
9-15	5" O. D.
16-18	5" I. D.
19-28	6" I. D.
29-40	8" O. D.
41-45	8" I. D.
46-50	9" O. D.
51-60	10" O. D.
61-72	10" I. D.

3. Dry Pipe Sleeves, Tube Sheet Rings and Tee Head Joints: Use per Standard drawings (see Index).
4. Throttle Lever: Make vertical distance from top of runboard (or flooring over same, if any) to end of handle, 45" to 48". See Group 48—Foreign Locomotives.
Use the following limits of travel at end and pull at a point 3" from end of lever:

TYPE OF LEVER	TRAVEL		PULL
	MINIMUM	MAXIMUM	MAXIMUM
Other than Woodard	16"	20"	30 lb.
Woodard	16"	20"	20 lb.

In figuring pull, use difference between areas of upper and lower seats at their mean diameters as the unbalanced area of valve, and deduct steam pressure on projected area of inside throttle rod (when used) from pull required on throttle crank.

5. Throttle Rod: Use Internal rod wherever possible and locate stuffing box about 9 inches to right side of center, when this location is more convenient than on the center. Provide intermediate support for all Throttle Rods over 10 feet long. Use approved make of flexible "Locomotive Throttle" packing, $2\frac{1}{4}$ " O. D., $1\frac{1}{4}$ " I. D. x 4" deep.
6. Ball Joint Ring: See Group 80.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

93 S 2306 d

July 7th, 1927

TOOLS.

Superseding
93 S 2306 c

APPROVED
ENGINEERING
COMMITTEE

1. Tools and Equipment: Furnish with each locomotive as follows:

TOOLS	
Select wrenches as required (no duplicates) for: Brake Equipment.....furnished by Maker Injectors..... " " " Lubricator..... " " "	Also one of each of the following:
Frame Pedestal Bolt } 932 A 4010-6 Main Rod, back end } Crank Pins, " " (recessed collar) } 932 A 4030-3 Crosshead Pins, Rod Knuckle Pins } Eccentric Set Screw } 932 A 4021-2 Rod Set Screw } Pipes—No. 4 Alligator..... 932 A 4020 18' Monkey Wrench Frame Suspension Bolt (Articulated)	DRAWING Screw Jack—10' closed..... 932 A 1010 Chisel Bar..... 932 A 5030 Packing Hook..... 932 S 93160 " Iron..... 932 S 93161 Machinists' Hammer, 2 lb..... Cold Chisel—flat..... 932 A 9000 " " —cape..... 932 A 9001 Coal Pick..... { Omit from } 932 A 2010 Scoop Shovel, No. 3 { wood-and } Poker..... { oil-burning } 932 A 2000-2 Ash Hoe..... { engines } 932 A 2005-7
EQUIPMENT	
DRAWING 1 Oil Can, 1 gallon { Eng's other } .. 932 S 30650 2 " " 2 " { than Artic'd } .. 932 S 30651 2 " " 1 " { Articulated } .. 932 S 30650 4 " " 2 " { Eng's only } .. 932 S 30651 1 " " 2 quart..... 932 S 30652 1 " " long spout..... 932 S 30653 1 Torch..... 932 A 3000 2 Flags—red..... 932 S 93090 2 " —white } furnished only for } .. 932 S 93091 2 " —green } Engines shipped } .. 932 S 93092 under steam 1 Hand Lantern, with white globe 1 " " " red "	DRAWING 2 Water Buckets—galv. iron, 12-quart 1 Coal Sprinkler Hose (¾" 3-ply rubber steam hose, 6 feet long.) (Omit from wood, oil and pulverized coal-burning locomotives. 1 Push Pole (switchers only)..... 932 A 6000 1 Sand Scoop } For Oil-burning 1 " Funnel } engines only. 2 Padlocks, 2 keys each

NOTE: Descriptive list giving sizes, drawing, pattern and die numbers is shown on Drawing 932 A 9040.

Furnish one Cab Stove with each shipment of engines shipped on their own wheels during the winter.

When tools and equipment are furnished by R. R. Co. on receipt of locomotives, supply the following with each shipment:

	DRAWING
1 18' Monkey Wrench.	
1 Packing Hook.....	932 S 93160
1 Packing Iron.....	932 S 93161
1 Machinists' Hammer, 2 lb.	
1 Cold Chisel, Flat.....	932 A 9000
1 Oil Can, 1 Gallon.....	932 S 30650
2 Oil Can, 2 Gallon (per engine).....	932 S 30651
1 Oil Can, Long Spout.....	932 S 30653

	DRAWING
1 Torch.....	932 A 3000
2 Flags, Red.....	932 S 93090
1 Hand Lantern, with white globe.	
1 " " " red "	
1 Water Bucket.	
1 Cab Stove (when shipped in winter).	
2 Padlocks, 2 keys each.	

2. Traversing Jacks: See Group 48, Foreign Locomotives.

American Locomotive Company

ENGINEERING DEPARTMENT

February 25, 1938

STANDARD PRACTICE

94 S 2307e ✓

VALVES, DISTRIBUTION

Superseding

94 S 2307d

APPROVED
ENGINEERING
COMMITTEE

1. PISTON VALVES: Use per Standard Drawings (see Index) as follows:

VALVE DIAMETER	VALVE STEM DIAMETER
9"	1-1/2"
10"	1-5/8"
11"	1-5/8"
12"	1-3/4"
13"	1-3/4"
14"	2"

SINGLE PORTED VALVES: Turn packing rings 5/32" larger in diameter than bore of bushing, cut out 7/16" wide. Close with 1/32" temporary liner between ends, re-turn or grind to exact diameter of bushing.

DOUBLE PORTED VALVES: Turn packing rings 1/16" larger in diameter than bore of bushing, cut out 7/32" and apply without re-turning or grinding.

FOLLOWERS: Make of cast steel, as per Standard Drawings (see Index).

2. VALVE STEM PACKING : See Group 78.
3. VALVE RODS and SOCKETS: Use dimensions per Standard Drawings (see Index).
4. VALVE ROD CROSSHEADS and GUIDES: Use dimensions as per Standard Drawings (see Index)

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co's drawings, specifications or instructions to contrary.

WHEELS

Superseding
95 S 2308 d

APPROVED
ENGINEERING
COMMITTEE

1. All new patterns of cast steel Driving Wheels to be in accordance with Standard drawing (see Index). Old patterns varying essentially in form or proportions must not be used.
Rims for all wheels to be cast solid having no cores except into counterbalance for adjustment.
Wheel centers of cast iron 54" diameter and under to have rims uncut; centers over 54" diameter may have rim cut in four places. Heavy cast iron centers of smaller diameter in which the counterbalance is cast solid and having crank hub close to or intersecting rim may have rim cut in two places. Cast steel centers to be cast solid in all cases when steel foundries will guarantee satisfactory castings.
All cuts in rim to be $\frac{3}{4}$ " wide when finished and are not to be shown on wheel drawings.
Metal between axle and crank pin fits of cast steel driving wheel centers to have a minimum thickness of 3".
2. Use bronze hub liners in cast steel wheels with plain cast steel boxes and boiler plate hub liners in cast steel wheels with plain cast iron boxes, in accordance with Standard drawings (See Index).
No hub liner in cast iron wheels.
When hub liners are used, make their outside diameter from $\frac{3}{4}$ " to 1" less than rough size of inside face of wheel hub, in order to allow for inaccuracies in castings, irregularity in foundry practice, eccentricity of hub, etc.
3. Use driving wheel keys of cold-rolled steel per Standard drawing (see Index), in cast iron or cast steel wheels. Locate key opposite crank pin.
4. Standard distance between hubs of driving wheels is 55".
5. Observe the following rules in Counterbalancing all Locomotive Driving Wheels:

- (a) Balance all revolving weights belonging to each wheel. The weights of each referred to the crank pin from their respective centers of gravity shall be considered as though applied at the crank pin.
- (b) Balance at least 50% of the reciprocating weights and divide equally between all the wheels on one side, except where normal speed is considerably below the diameter-speed the balance may be increased to 60% or 65% (maximum) of the reciprocating weights.

When possible, the reciprocating parts should be so designed that their total weight on one side of the engine will be less than $\frac{1}{1600}$ th part of the total running order weight of engine. It has been found that 60 pounds of piston thrust (area in square inches by maximum boiler pressure) per pound of reciprocating weight represents good practice, although it has been possible by special design of parts to increase this figure to 80 or 85 pounds.

- (c) The centrifugal force of the balance for reciprocating parts at 336 revolutions per minute must not exceed 50% of the minimum weight on any single wheel for any engines except pusher Mallet and switchers. For pusher Mallet and switching engines, the centrifugal force of the balance for reciprocating parts per single wheel at 300 revolutions per minute must not exceed 63% of the minimum weight on any single wheel.

NOTE: The combined centrifugal force of the balances per pair of wheels, resolved vertically is a maximum with the centers of balances 45° each side of vertical center line, and equal to that of a single wheel multiplied by 1.41.

- (d) Where it is impossible to obtain the required amount of balance in any wheel, excess weight may be transferred to the other wheels, not exceeding the limitations in section (c).
- (e) The sum of the revolving and reciprocating weights for each wheel found as above, figured at the radius of the crank pin, to be placed in counterbalance having center of gravity as far from center of axle and as close to rods as possible, clearance not to be less than $\frac{3}{4}$ ".
- (f) Solid counterbalance blocks must be used wherever possible to do so and obtain correct balance.
- (g) Use lead-filled balances only where sufficient weight is not obtainable with solid balances.

Lead cavities in balance must be smooth as possible and cored through rim of wheel. Great care must be taken to remove all sand.

Because of the difficulty in providing sufficient counterweight in the Main wheels of 2-10-2 type locomotives to balance even the revolving weights, the question of using plates to cover counterbalance weight cavities in these wheels should be considered in cases where long stroke, low wheel and large size of locomotive exist.

When the dynamic augment of the deficiency of balance in the main wheels for the revolving weights exceeds 50% of the average weight per wheel at diameter-speed, then the use in main wheels of cavities closed by plates should be considered, and question raised.

To reduce the discrepancy between the estimated and actual counterbalance weight in lead-filled driving wheels, proceed as follows:

- (a) Inspectors at steel foundries should check over core boxes and measure up enough castings to satisfy themselves that dimensions of pockets, walls and ribs are being followed closely.
- (b) See that pockets are solidly filled with lead, after they have been thoroughly cleaned out and freed from sand and foreign substances.
- (c) As much as possible, scum or dross on surface of molten lead should be rejected and only solid metal used.
- (d) When cross-counterbalancing is specified, follow A. R. A. recommended practice.

CALCULATIONS: Accurate calculations for counterbalance must be made for each order and reported on Form E. D. 386. This must be checked and signed by men making same and be approved by the Chief Draughtsman*.

In case these calculations show that desirable results cannot be obtained, proceed as follows:

- (a) In case of solid balance blocks, substitute cored and lead-filled balance.
- (b) In case cast iron centers are specified and correct balance cannot be obtained by coring, raise question with proper officials as to substitution of cast steel centers.
- (c) Counterbalance calculations may be made by a Local Drawing Room, the results of which must be entered on Form E. D. 386 and receive the approval of the General Drawing Room before any wheels are cast.

LEAD: Where lead is used for filling, it must have a weight of not less than 0.37 lb. per cubic inch.

REVOLVING WEIGHTS: Crank Pins, Crank Pin Collars and Nuts, Eccentric Crank and back-half of Eccentric Rod, Back End Main Rod and portion of Side Rod and Oil Cups, belonging to each wheel, must be accurately weighed by the shop and reported to the Chief Draughtsman* for each order on Form E. D. 439.

RECIPROCATING WEIGHTS: Piston and Packing and Piston Rod, Crosshead and Crosshead Arm and front end of Main Rods, must be accurately weighed by the shop and reported to the Chief Draughtsman* for each order on Form E. D. 433.

NOTE: In weighing Rod, Side Rods should be connected together and supported on round bars in center of each bearing, weighing each bearing separately, then check by total weight. Main rods to be supported in each bearing and respective weights obtained to be applied where they belong.

TESTING: For all passenger and fast freight locomotives, each pair of wheels for each engine must be weighed and have counterbalance properly adjusted before engines are allowed to leave works.

For ordinary freight and switching locomotives each pair of wheels for first engine in each order and for each seventh engine thereafter, must be weighed and have counterbalance adjusted, this adjustment to be followed on each subsequent engine until next weighing, but in case first weighing shows irregularities that should not exist, each subsequent engine must be weighed until error is found and corrected.

The counterbalances of all wheels are, to be weighed before tires are applied. Main wheels with lead filled balances are to be weighed after crank pins have been pressed into wheel centers, but wheels with solid balances, or where adjustments have to be made to the balance block, are to be weighed before crank pins are pressed into wheel center. This requires the use of a dummy pin and adjustments in weight for the difference in weight between the crank pin and the dummy pin and the rough and finished bore of the crank pin wheel fit must be made. Such adjustments will be furnished the shop by the Chief Draughtsman* or his representative at the time the first set of wheels is weighed, along with any other adjustments that must be made. In case of important engines, the shop will be advised the limit within which counterbalance weights must be held. Weights given the shop are usually based on estimate weights of rods etc

The Chief Draughtsman* will report immediately to General Drawing Room for each case where correct balance cannot be obtained.

RESPONSIBILITY: All wheels must be weighed and adjusted to comply strictly with the above rules, either in the presence of or to the satisfaction of the Chief Draughtsman* or his representative. The Chief Draughtsman* will be responsible for the accuracy of counterbalance calculations, correctness of reports from shop and for proper adjustment of all counterbalances and will report all cases where instructions are not carried out in the shops.

NOTE: Counterbalances made from R. R. Co.'s or other Works' drawings, must be carefully figured over to determine their accuracy, and if not correct, question must be raised.

REPORTS:

Counterbalance Data, Form E. D. 386.....Office
 " Report " E. D. 439.....Shop
 " " E. D. 323.....Shop

Form E. D. 323 must be approved by the Chief Draughtsman* for each set of wheels. For all engines designed in the General Drawing Room, the Works building the engines must send to the General Drawing Room, upon the completion of the order, a copy of Form E. D. 323 for each engine weighed. The General Drawing Room will enter these weights together with the actual weights from Form E. D. 439 on the counterbalance sheet, Form E. D. 386, and this sheet will be filed as a permanent record of the engines. For engines designed at the local Works, Form E. D. 386 will be filled out and filed by them, with copy to General Drawing Room as soon as weights are complete. Actual conditions as finally obtained will be reported by the General Drawing Room to Vice President of Engineering.

6. Standard distances between hubs of all standard gauge Engine and Tender Truck Wheels:

Engine truck..... 52"
 Tender " except 6' x 11' journals)..... 48"
 " " (6' x 11' journals)..... 47"

Standard principal dimensions are given in tables below:

ENGINE TRUCK WHEELS					
JOURNAL	WHEEL FIT	STEEL TIRE		CAST IRON	
		HUB		HUB	
DIAMETER x LENGTH	DIAMETER x LENGTH	DIAMETER x OFFSET	TREAD	DIAMETER x OFFSET	TREAD
5" x 10"	5 1/2" x 7"	12 1/2" x 1 1/8"	A. R. A.	12 1/2" x 1/2"	A. R. A.
5 1/2" x 10"-12"	6" x 7"	12 1/2" x 1 1/8"		12 1/2" x 1/2"	
6" x 12"	6 1/2" x 7"	13 1/2" x 1 1/8"		13 1/2" x 1/2"	
6 1/2" x 12"	7" x 7"	16" x 1 1/8"		16" x 1/2"	
7" x 12"	7 1/2" x 7"	16" x 1 1/8"		16" x 1/2"	
7 1/2" x 12"	8" x 7"	16" x 1 1/8"		16" x 1/2"	

TENDER TRUCK WHEELS					
JOURNAL	WHEEL FIT	STEEL TIRE		CAST IRON	
		HUB		HUB	
DIAMETER x LENGTH	DIAMETER x LENGTH	OFFSET x DISH	TREAD	OFFSET x DISH	TREAD
3 3/4" x 7"	5 1/4" x 7"	2 1/4" x 1 9/16"	A. R. A.	2 3/32" x 7/8"	A. R. A.
4 1/4" x 8"	5 3/4" x 7"	2 7/8" x 1 9/16"		2 3/32" x 7/8"	
5" x 9"	6 1/2" x 7"	2 7/8" x 1 9/16"		2 3/32" x 7/8"	
5 1/2" x 10"	7" x 7"	2 7/8" x 1 9/16"		2 3/32" x 7/8"	
6" x 11"	7 3/8" x 7 1/2"	3 1/8" x 1 3/16"		3 3/32" x 1 1/8"	
6 1/2" x 12"	8 1/4" x 7 1/2"	3 3/8" x 1 3/16"		3 3/32" x 1 1/8"	

When made by A. L. Co., wheels are to be in accordance with Standard drawings (see Index). These drawings cover wheels for standard gauge, but may be used for other gauges where suitable. If wheels are ordered outside, use Standard ordering drawings (see Index), and order axle fit rough bored 1/4" smaller in diameter than finished bore. When 33" chilled cast iron tender truck wheels are specified and weight not given, follow A. R. A. Recommended Practice as given below:

TENDER JOURNALS	WEIGHT OF 33" WHEELS	
	NOMINAL	MINIMUM
4 1/4" x 8"	650 pounds	640 pounds
5" x 9"	700 "	690 "
5 1/2" x 10"	750 "	740 "
6" x 11"	850 "	835 "

*Calculating Engineer at Sch'dy Works, Chief Draughtsman at other Works.

7. See Group 17.—Truck Wheel Hub Liners.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

June 27, 1938

STANDARD PRACTICE

95 S 2309f

WHEELS

Superseding

95 S 2309e

APPROVED
ENGINEERING
COMMITTEE

1. Bore and groove all DRIVING, TRAILING and TRUCK WHEEL TIRES at A. L. Co. Works, whether straight-bore, lipped or for retaining rings. Order tires in the rough. DRIVING tires to be rolled in sets, and TRAILING and TRUCK WHEEL tires in pairs, without reference to any drawing.

Carefully caliper and tape all tires. TURN Tires as follows:

DRIVING All 66" O.D. and over.
Under 66" O.D. if circumference varies over 1/8" or diameter varies over 1/32" in same set.

TRUCK and TRAILING - If circumference varies over 1/16" in same pair, after mounting.

All DRIVING tires to be marked in sets by maker and lists furnished for matching.

Use WIDTHS and SECTIONS of Tires to AAR Standards, unless otherwise definitely specified, or for small narrow gauge engines.

FLANGED TIRES

Driving (ROAD Engines) 5-1/2" wide, Flange Height, 1"
" (SWITCHING Engines) 5-1/2" wide, " " 1"
Engine Truck and Trailing 5-1/2" wide, " " 1"
Tender Truck 5-1/2" wide, " " 1"

PLAIN TIRES

Driving (plain standard width) 6" wide
" (" extra ") 6-1/2" wide

Plain Tires are to be used only when specified or required by abnormal conditions.

DRIVING WHEEL HUB LINERS AND RIVETS: Apply as per Standard drawings (see Index).

ENGINE AND TENDER TRUCK WHEELS

Nominal Diam.	Exact Dia. of Wheel	TIRES							
		Ins. Dia. Rough	Width	THICKNESS					
				Rough			Finished		
				Thin	Stand.	Thick	Thin	Stand.	Thick
26"	20-1/4"	20"							
28"	22-1/4"	22"							
30"	24-1/4"	24"							
33"	27-1/4"	27"	5-1/2"	2-3/4"	3"	3-1/4"	2-5/8"	2-7/8"	3-1/8"
36"	30-1/4"	30"							
38"	32-1/4"	32"							
42"	36-1/4"	36"							

Make RETAINING RINGS for A. L. Co. truck wheels to Standard drawing (see Index).

2. TIRE SETTING - STANDARD GAUGE

DRIVERS: On locomotives equipped with the proper lateral guiding devices, use all flanged tires, making distance back to back 53-3/8". Articulated locomotives are to be considered as individual cases and a layout made of the locomotive on the governing curve to determine the best tire setting, considering the effect of the location of the hinge pin.

TRUCKS: Use the following:

TRUCK	WHEELS	WIDTH OF TIRE	DISTANCE BETWEEN BACKS
LEADING	Steel Tired, Rolled Steel	5-1/2"	53-3/8"
	Cast Iron	5-25/32"	53-1/8"
TRAILING	Steel Tired (Radial Truck)	5-1/2"	53-3/8"
	" " (Rigid Truck)	5-1/2"	53-1/4"
	Rolled Steel	5-1/2"	53-3/8"
	Cast Iron (Chilled)	5-25/32"	53-1/8"
TENDER	Steel Tired, Rolled Steel	5-1/2"	53-3/8"
	Cast Iron (Chilled)	5-25/32"	53-1/8"

All DRAWINGS showing AAR Standard tire sections must bear notation similar to the following: " AAR STANDARD".

3. TIRE SETTING - NARROW GAUGES: Use distances between backs of flanged tires as follows:

GAUGE	FLANGE PLAY	TIRE SETTING (ALL PAIRS)	
		FLANGE WIDTH	
		1"	1-1/4"
2'-0"	1/2"	21-1/2"	21"
2'-6"	1/2"	27-1/2"	27"
3'-0"	5/8"	33-3/8"	32-7/8"
3'-3-3/8"	5/8"	36-3/4"	36-1/4"
(METER)	16 mm.	933 mm.	921 mm.
3'-6"	5/8"	39-3/8"	38-7/8"

This table makes the distance between backs of all tires the same on a given engine, in accordance with the prevailing European practice. When curvature conditions require, consider thinning flanges of intermediate tires or using plain tires on these wheels.

For OTHER THICKNESSES OF FLANGE a corresponding change should be made in the setting, to maintain the flange play given in the second column.

On ARTICULATED LOCOMOTIVES, after obtaining Purchaser's approval, vary the flange play of the different pairs of wheels in accordance with our Standard Practice for standard gauge articulated locomotives.

4. See GROUP 56 - Laws, Rules and Instructions, ICC Public Service Comm. etc.

5. See GROUP 48 - Foreign Locomotives.

QUESTION: Duplicate engines.
EXCEPTIONS: R.R. Co's drgs.
specifications, or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

96 S 2311 a

July 27th, 1925

WHISTLE

Superseding
96 S 2311

APPROVED
ENGINEERING
COMMITTEE

1. **Whistle Design:** Use cast iron five-chamber chime whistle, or when specified, brass chime or plain whistle, per Standard drawings (see Index).
2. **Whistle Location:** When located in top of boiler and clearance limitations prevent placing vertically on top center, use angle extension turning whistle backward and at an angle of 30° from the horizontal to prevent steam being blown directly towards cab. Arrange pull-rod as nearly parallel to center line of whistle as practicable.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

99° S 2312 a

May 26th, 1920

MISCELLANEOUS Index to Standard Classification

Superseding
99° S 2312

APPROVED
ENGINEERING
COMMITTEE

GROUP		GROUP		GROUP	
NO.	TITLE	NO.	TITLE	NO.	TITLE
	AIR Gauge Stand—see 18.	43	Erect. Dwgs.—Switchers & D. E.		Signal Attachments—see 54.
	Air Reservoir—see 19.	44	EXHAUST Pipes & Nozzles.	74	SMOKE BOX Arrangt. & Front.
	Apron, Cab—see 23.		Ex. Pad, Knee & Plate—see 47.		Smoke Consumer—see 45.
10	ASH PAN.		Extensions—see 26.	75	SMOKE STACK.
11	AXLES.		Feed Water Attachments—see 55.		Speed Recorder—see 99.
12	BELL.		Feed Water Heater—see 55.		Stands—see 18.
	Blow-off Cock—see 26.	45	FIRE DOOR, Fire Brick, &c.	76	SPRINGS.
	Blower Pipe Elbow—see 63.		Fire Box Ring—see 14.	77	Spring Rigging.
13	BOILERS.		Flag Fixtures—see 54.	78	STEAM CHEST & Details.
14	Boiler Details & Attachments.		Flue Sheet Ring—see 91.	79	Steam Gauges, Safety Valves, &c.
15	BOLTS, Studs, Bushings, &c.	46	FRAMES.	80	STEAM PIPES & Tee Heads.
	Booster—see 92.	47	Frame Details.		Steps—see 53 and 87.
16	BOXES, Driving.		Foot Plate—see 47.		Steam Heat—see 64.
17	Boxes, Truck.		Fusible Plug—see 66.		STOKERS—see 51 and 52.
18	Brackets, Stands, &c.	48	FOREIGN LOCOMOTIVES.		SUPERHEATERS—see 80.
19	BRAKE Equipment.	49	GAUGES, Templates & Jigs.	81	.....
20	Brake Details, Engine.		Gauge Cocks—see 27.	82	TANK Valves, Cocks & Hose.
	Brick Arch—see 45.	50	GUIDES & Attachments.	83	Tanks & Coal Bunkers, Engine.
	Buffer, Engine (front)—see 37.	51	GRATE Arrangement.		Templates—see 49.
	Buffer, Engine (rear)—see 47.	52	Grate Details.	84	TENDER BRAKES.
	Buffer, Tender—see 86.		Grease Cups—see 60.	85	Tender Frames.
21	BUMPERS.		Handholes—see 66.	86	Tender Draw-Gear.
	By-Pass Valve—see 34.	53	HANDRAILS & Steps, Engine.	87	Tender Steps, Hand Rails, &c.
22	CABS.		Header, Superheater—see 80.	88	Tender Tanks.
23	Cab Details.	54	HEADLIGHTS, Lamps, No. Plates	89	Tender Trucks.
24	Cab Fittings.		& Signal Attachments.		Tender Truck Box—see 17.
	Cab Handle—see 53.		Headlight Step—see 53.		Tender Truck Wheels—see 95.
	Cab Lamp—see 54.		Hub Liners—see 16, 17 & 95.	90	Tender Water Scoop.
	Cab Turret—see 79.		Intercepting Valve—see 33.	91	THROTTLE & Dry Pipe.
	Chafing Plate—see 47.	55	INJECTORS & Feed Water Atts.		TIRE—see 95.
	Cinder Valve & Pipe—see 74.		Jigs—see 49.	92	Traction Increaser & Booster
	Clearances—see 99°.		Keys—see 15.		Trailing Trk. & Dets.—see 40 & 41.
	Coal Pusher—see 88.	56	LAWS, Rules & Instructions.	93	TOOLS.
25	COCKS & VALVES under 1½'.		LAGGING & Jacket.		Tool Boxes, Cab—see 24.
26	Cocks & Valves, 1½' and over.	57	Lamps—see 54.		Tool Boxes, Tender—see 87.
27	Cocks—Gauge, Water & Special		Lateral Motion Driv. Box—see 16.		Tube Setting—see 14.
28	Cock Riggings.	58	LINK Motion.		Turrets—see 79.
	CONNECTING RODS—see 72.		LUBRICATOR—see 60.		Uncoupling Shaft, Eng.—see 37.
	Coupler, Engine—see 37.		Mud Drum—see 14.		Uncoupling Shaft, Tend.—see 86.
	Coupler, Tender—see 86.		Number Plates—see 54.	94	Vacuum Valve—see 34.
	Coupling Nuts—see 63.	59	.....		VALVES, DISTRIBUTION.
	Cradle, Frame—see 46.		Oil Can Holder—see 18.		Valve Stem Guide—see 94.
29	CRANK PINS.	60	OIL CUPS & Lubrication.		Valve Yoke and Rod—see 94.
30	CROSSHEAD & Crosshead Arms.	61	OIL BURNING Attachments.		Waist Sheet—see 47.
	Crosstie—see 47.		Packing, Piston Rod—see 65.		Walschaert Ecc. Crank—see 39.
31	CYLINDERS.	62	Packing, Valve Stem—see 78.		Walschaert Valve Gear—see 58.
32	Cylinder Heads & P. V. Bushing.		PILOT and Snow Plow.		Water Gauge—see 27.
	Cylinder Head Relief Val.—see 34.	63	Pedestal Bolt & Thimble—see 46		Water Gauge Lamp—see 54.
33	Cylinder, Comp. Attachments.		PIPE Fittings, Unions, &c.	95	Water Scoop—see 90.
34	Cylinder, By-Pass & Relief Valves.	64	Piping Arrangt., Eng. & Tender.		WHEELS.
35	DIE WORK.	65	PISTONS & Piston Rods.		Washout Plugs—see 66.
36	DOME & Attachments.		Piston Rod Ext. Guide—see 65.	96	Wheel Cover—see 71.
37	DRAW-GEAR, Engine.		Piston Valve—see 94.	97	WHISTLE & Rigging.
	Draw-gear, Tender—see 86.		Piston Valve Bushing—see 32.		.....
	Draft Pipe—see 74.	66	PLUGS, Hand & Cleaning Holes.	98	DESIGNS, Preliminary.
	DRIVING Box—see 16.	67	.....	99	MISCELLANEOUS.
	Driving Box Saddle—see 77.		Receiver Pipes—see 33.	99 ¹	Material—Kinds, Sizes & Specsns.
	Driving Spring Hangers—see 77.		Relief Valve—see 34.	99 ²	.....
	Driving Wheels—see 95.		Retaining Rings—see 95.	99 ³	.....
	DRY PIPE—see 91.	68	REVERSE Lever, Gear & Screw.	99 ⁴	Inspection & Reports.
38	.....	69	Reverse Shaft & Reach Rod.	99 ⁵	Finish, Arrangt., Painting, &c.
39	ECCENTRIC & Straps.	70	ROCKERS & Boxes.	99 ⁶	Clearances & Curvature.
	Eccentric Crank—see 39.	71	RUNBOARDS, Wheels Covers, &c.	99 ⁷	.....
40	ENGINE TRUCKS.	72	RODS, Knuckle Pins & Stubs.	99 ⁸	Rules, Formulæ & Tables.
	Engine Truck Box—see 17.		SAFETY VALVES—see 79.	99 ⁹	Miscellaneous.
	Engine Truck Details.		Shoe & Wedge—see 46.		
	Engine Truck C. P. Guide—see 47.		Side Sheet—see 71.		
	Engine Truck King Bolt—see 47.	73	SAND BOXES & Riggings.		
	EQUALIZER—see 77.				
42	ERECTING Dwgs.—Tender Engines				

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

99' S 2313 h

July 26th, 1926

MISCELLANEOUS Materials—Kinds, Sizes & Specs. for

Superseding
99' S 2313 g

APPROVED
ENGINEERING
COMMITTEE

1. American Locomotive Company's Standard Specifications for Material, issued to date:

1-H	Boiler and Firebox Steel.	73-B	Chrome-Vanadium Steel for Crosshead Keys.
3-I	Steel Castings.	80-B	Type "A" Chrome-Vanadium Driving Axles.
7-A	Brass Tubes for Locomotive Boilers.	81-D	Chrome-Vanadium Billets for Locomotive Forgings.
8-F	Refined Wrought Iron Bars.	83-B	Annealed Copper Plates for Locomotive Fireboxes.
*10-F	Steel Billets for Forgings.	84-C	Copper Bars for Staybolts and Rivets.
11-A	Tubes for Powerhouse Boilers.	86-A	Chrome-Vanadium Main and Side Rods, &c.
12-H	Staybolt Iron.	87-A	Vanadium Steel Castings.
14-D	Carbon Steel Bars for Springs.	88-B	Heat-treated Carbon Steel Axles, &c.
15-C	Tank and Miscellaneous Steel Plates.	91-C	Wrought Iron Draw Bars and Equalizers.
17-C	Structural Steel.	92-A	Superheater Header Castings.
18-C	Steel Tires.	93-A	Annealed Driving, Engine Truck and Trailing Truck Axles, Main and Side Rods and Rod Straps.
20-C	Rivet Steel and Steel Rivets.	95	Quenched and Tempered Carbon Steel Main and Side Rods and Straps.
21-B	Elliptic and Semi-Elliptic Springs.	98	Miscellaneous Gray Iron Castings.
22-F	Engine Bolt Iron.	101	Forging Ingots.
23-C	Radial Stay and Boiler Brace Iron.	102-A	Low-Carbon Steel Drawbar and Safety Bars.
24-B	Pig Iron.	103	Extra Refined Wrought Iron Bars.
25-C	Tender Truck Axles.	104	Welded and Seamless Steel Pipe.
26-A	Turpentine.	105	Welded Wrought Iron Pipe.
28-B	Locomotive Cylinders.	106	Hollow Staybolt Iron.
29-B	Brass Castings.	109	Chrome Nickel Steel Bars for Superheater Unit Bolts.
30-B	Ingot Metals.		
32-C	Linings for Bearings.		
33-C	Belting.		
35-D	Bronze Bearing Metal.		
36-G	Lap-Welded and Seamless Steel and Lap-Welded Iron Boiler Tubes.		
37-C	Steel Bars for Case-hardening and Welding.		

*Class A—For Engine Axles, Main and Side Rods, Crank Pins, Piston Rods, Rod Straps and Guides.
Class B—For forgings subject to case-hardening or welding.

2. Steel Forging Billets of standard sizes, and to A. L. Co.'s regular specifications for carbon steel will be kept in stock. Except where special steel is required, or very large orders involved, this material will be taken out of stock and applied to order.

Enter in the material books for the use of Stock and Accounting Departments, the size and weight of billets required for driving, trailing and engine truck axles (if forged in Company's shops), crank pins, piston rods, guides, main and side rods, for one engine only. See Group 11.—Axle Billets.

Billets will be ordered for stock in standard sizes and weights (see below) and cut as required to exact lengths, preferably by sawing, to avoid unnecessary waste.

Use the standard sizes and weights of forging billets given in tables below, preferably those indicated in heavy-faced type, in order to facilitate deliveries. The eight sizes not shown in heavy-faced type should not be ordered when additional sawing machines are provided.

In order to reduce the amount of cold sawing required before additional sawing facilities are provided at the different plants, the 8½' x 6' billets used for forging motion work and small miscellaneous parts may be ordered in 1000 lb. weights.

Manufacturers should be notified that billets, especially the smaller sections, must be reasonably straight before shipping.

FOR PISTON RODS, CRANK PINS, DRIVING, TRAILING AND ENGINE TRUCK AXLES			
SIZE	WEIGHT	SIZE	WEIGHT
7' x 7'	2000-3000	14' x 14'	4500
8' x 8'	3000-3500	14' x 14'	4900
9' x 9'	3500-4000	15' x 15'	5400
10' x 10'	4500-5000	15' x 15'	5800
11' x 11'	4500-5000	16' x 16'	6300
12' x 12'	5000	16' x 16'	6800
13' x 13'	4100		

FOR MAIN AND SIDE RODS, GUIDES, ETC.			
SIZE	WEIGHT	SIZE	WEIGHT
10' x 6'	3000-3500	16' x 7'	4000-5000
16' x 6'	4000-5000	18' x 7'	4000-5000
12' x 7'	4000-5000	20' x 8'	4000-5000
14' x 7'	4000-5000		

FOR AXLES (SCHEMATA WORKS ONLY)	
SIZE	WEIGHT
12' x 12'	6000-7000
13' x 13'	9000-10000
14' x 14'	9000-10000
15' x 15'	10000-11000
16' x 16'	10000-11000

FOR PISTON RODS, EQUALIZERS, ETC. CONTRACTOR ENGINES	
SIZE	WEIGHT
6' x 6'	1000-1500

FOR MOTION WORK, AND SMALL MISCELLANEOUS PARTS	
SIZE	WEIGHT
8½' x 6'	2500-3000

(OVER)

MISCELLANEOUS
Materials—Kinds, Sizes & Specs. for

STANDARD PRACTICE

99' S 2313 h

3. Case-harden the following as regular practice:

GROUP	DETAILS	GROUP	DETAILS
28	Cylinder Cock Rigging Pins.	58	Link Pins, Nuts and Bushings.
29	Crank Pin Nuts.		Link Block and Plate.
30	Crosshead Wrist Pin Nuts.		“ Saddle Pin and Nuts.
39	Eccentric Rod Jaw Nuts and Pins.	65	Piston Rod Nuts—back end with Thomas type Crosshead only.
41	Engine Truck Swing Link Pins—lower.	68	Reverse Lever Fulcrum Pin, Nuts & Bushings.
	“ “ Spring Hanger Pins.		“ “ Quadrant.
	“ “ Equalizer Pins.		“ “ Latch, Bolts and Nuts.
47	Foot Plate Bushing (for draw bar).	69	Reach Rod End Pins and Nuts.
50	Guides when wrought Iron.		Reverse Shaft Arm Pins, Nuts and Bushings.
	STEPHENSON.	72	Rod Knuckle Pin Nuts.
58	Transmission-Bar-and-Hanger Pins, Nuts and Bushings.		“ Wedge Bolt Nuts.
70	Rocker Pins, Nuts and Bushings.		“ Strap Bolt Nuts.
	WALSCHAERT.	77	Spring Hanger Gib when made of soft steel. Pins.
39	Eccentric Crank Pin Nuts and Bushings.		Driving Box Saddle Pins.
58	Radius Bar Slide, and Hanger Pins, Nuts and Bushings.		Equalizer Pins.
	STEPHENSON AND WALSCHAERT.		“ Bushings.
	Combination-Lever-and-Link Pins, Nuts and Bushings.	91	Throttle Crank Pins.
	Link Bracket Bushings.		“ Lever Bolts, Pins and Bushings.
	STEPHENSON AND WALSCHAERT.	94	Valve Rod Pins, Nuts and Bushings.
	Link—Ends protected to avoid cracking in corners.		

NOTE: Use an approved surface hardening process for throttle lever quadrant and latch. Grind accurately to gauge all valve motion pins and bushings after case-hardening. Bushings preferably to be forced in place before grinding.

Make Pins and male end to dimensions, allow clearance on holes and inside of jaws.
All nuts and bolts to have threaded portion protected by fire clay.

In addition to the above include the following for full case-hardened engine for which extra charge is made.

GROUP	DETAILS	GROUP	DETAILS
20	Driver Brake Hanger Pins and Bushings.	84	Tender Frame Brake Details, Jaws, Pins and Bushings.
	“ “ Beam Bushings.		Tender Truck Brake Details, Jaws, Pins and Bushings.
	Brake Rod Jaws.	85	Tender Spring Hangers and Seats (for 6-wheel Tenders only).
	Brake Articulations.		Tender Frame Spring Equalizers, Pins and Bushings (for 6-wheel Tenders only).
37	Draw Bar Pins and Bushings.	91	Throttle Lever Link.
41	Engine Truck Swing Link Pins, Top “ “ “ “ Bushings.	99	Speed Indicator Rigging.
	Radius Bar End Bushings.		
	Engine Truck Equalizer Bushings.		
45	Fire Door Latch and Catch.		
69	Reach Rod Guide Slide Plate.		
77	Equalizer Seat.		
	Spring Hanger Ends.		
	“ Rigging Bushings (when used).		

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

99' S 2316 b

July 27th, 1925

MISCELLANEOUS Material—Kinds, Sizes, & Specs. for

Superseding
99' S 2316 a

APPROVED
ENGINEERING
COMMITTEE

Steel Castings: Anneal all steel castings. Make radii of all external and internal corners, edges and bases of ribs, etc. as large as consistent with design, preferably from $\frac{1}{4}$ " to $\frac{3}{4}$ ".

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

99⁺ S 2318 c

December 1st, 1931

MISCELLANEOUS Inspection and Reports

Superseding
99⁺ S 2318 b

APPROVED
ENGINEERING
COMMITTEE

1. Before the last engine from an order is completed, especially when of new design, a thorough inspection should be made by the Chief Draughtsman and Resident Inspector consulting with the Superintendent, to see if any **Changes or Improvements in Design or Construction** are desirable. The Resident Inspector should call attention to any matters which have come under his notice which are not readily visible or accessible for inspection at this time. Any employee wishing to submit criticisms or recommendations is encouraged to do so.

Criticisms of design and recommendations covering change in same for future engines, when made by persons at a local Works or in the Engineering Department at Schenectady (except the Consulting Engineers) must be made out on white copies of Form E. D. 1050 and submitted to the Mechanical Engineer. These preliminary forms will be gone over in the Engineering Department at Schenectady and final (blue) forms E. D. 1050 issued by that Department covering such items as it is judged desirable to consider for future engines, giving credit on these forms to the person making the original suggestions.

Forms made in the Engineering Department at New York, by the Consulting Engineers, or by a Local Works to cover suggested changes in future duplicates of engines designed at that Works, will be made out on the final (blue form) and need not be submitted to the Mechanical Engineer.

When an order of engines is placed in the General Drawing Room, all E. D. 1050 Forms for the previous order which accompany the specification must be gone over by the elevation and detail engineers affected, at once. In case the suggestion on the Form can be followed, make notation to that effect and return Form to Correspondence Room. If there are good reasons why the Form cannot be followed, authority for disregarding it must be obtained from the party making it, provided it originated in the Engineering Department at Schenectady or New York. Otherwise such authority must be from some one of the supervising force of the General Drawing Office.

In case such suggestions cannot be followed for order under consideration, but should be brought up on future orders, reissue Form for order under consideration.

The following notations will be made on the corresponding file copies of the Form.

To whom issued

For consideration on Order

Date

2. Whenever members of the Engineering Department (with the exception of Consulting Engineers) are instructed to conduct tests or make special investigations of any subjects, a **Technical Report** covering their work must be submitted as indicated below:

In general, such reports should cover:

- A clear statement of the purpose of the investigation.
- Description of the locomotive or device on which the tests and investigations were conducted, with photographs of same where possible.
- Description of apparatus, if any, used in making investigations. (in case instruments such as high grade thermometers, or steam engine indicator, calibration report must be included).
- Results of the investigations which should be presented in tabulated and plot form, if the data is capable of being plotted.
- Deductions and recommendations.

Bind reports in Technical Report covers, Form E. D. 307.

3. Set up motion work of Walschaert Gear engines noted below, on valve model, obtain valve motion diagram and fill in events called for on Form E. D. 18-A and 18-B.

- All new designs of passenger engines.
- New designs of freight engines where order is for 25 or more.
- New designs involving special features of valve gear design (irrespective of the number of engines in order).
- All sample engines.
- All new designs of foreign engines.

Report Valve Motion for all engines as follows:

Complete report Form E. D. 18-A to be filled out for first engine in each order.

Report giving principal points only as indicated on Form E. D. 18-B to be filled out for all other engines in each order.

On reports covering Compound engines, omit figures for cut-offs less 50%.

American Locomotive Company

ENGINEERING DEPARTMENT

March 7, 1938

STANDARD PRACTICE

99⁵ S 2319c

MISCELLANEOUS
FINISH, ARRANGEMENT, PAINTING, etc.

Superseding
99⁵ S 2319b

APPROVED
ENGINEERING
COMMITTEE

1. The preferred style, shape and arrangement of Locomotive Finish is as follows:

GROUP

- 19 AIR PUMP located on left side, ahead of throat sheet. (To avoid excessive spring loads and journal bearing pressures, air pumps and feed water pumps should not be located on same side of engine.)
MAIN RESERVOIR on left side, ahead of pump under runboards, allowing ample clearance between it and pump for pipe connections. (When two main reservoirs are required, locate one each side, under runboards).
- 37 UNCOUPLING RIGGING to form horizontal grab iron on road engines.
- 53 HANDRAILS to be 1" I.D. iron or steel pipe. Long handrails must be horizontal and project thru end columns to center of balls. Short handrails to terminate in balls of columns. Center of balls on long and short handrails in same vertical line.
CAB and TANK HANDLES in cab gangway must not be less than 19" between, in the clear, for old designs, and 22" for new designs. See that the clear distance is not less than 16" in any case, when passing maximum curvatures. Lower ends not over 54" from track and upper ends of handles same height above firing deck.
Grab handle under headlight shelf.
Handrails and grab irons must have not less than 2-1/2" clearance to the nearest point.
STEPS on each side of bumper of road engines, steps on left side for headlight, also for dynamo when electric headlight is used, and for sand box on both sides.
- 54 Headlights brackets attached to top of smokebox, if clearance is sufficient for headlight, when clearance is not sufficient, brackets attached to smokebox front.
- 71 RUNBOARDS on all piston valve engines to extend to within about 12" from front of smokebox.
In locating back end of runboards and handrails, proper clearances should be provided for washout plugs, blow-off cocks, reach rod, injector piping, etc.
- 87 TENDERS to have large double steps front and back.
No bolt heads to project thru treads of any steps. Where bolts are used thru treads, they should be countersunk. All treads must be perfectly flush.