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THE BALDWIN LOCOMOTIVE WORKS

SPECIFICATION

NO. C - 6159

CLASS 10 26 $\frac{1}{4}$ D

CODE WORD -

FOR SOUTHERN PINE LUMBER COMPANY

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THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA November 12, 1919.

Class 10 26 ½ D **SPECIFICATION No.** 6-6159 Drawing No. 40

Of a Ten Wheeled Type Locomotive Engine having THREE pairs of coupled wheels, with a two wheeled truck at front and rear.

For SOUTHERN PINE LUMBER COMPANY

This specification may be designated in cabling by code word -

GENERAL DIMENSIONS

Gauge	4 Ft. 8-1/2 Ins.	Fuel	Oil	Boiler, Diameter	52 Ins.	Type	Ext. Wagon Top
Cylinders	Simple Dia. 16	Ins. Stroke	24 Ins.	Fire Box	69-7/16 Ins.	Long	34-1/4 Ins. Wide
Drivers, Diameter	48 Ins.	Working Pressure	180 Lbs.	Tubes No.	15 Dia. 5½ Ins.	Length	13 Ft. 3 Ins.
Wheel Base, Driving		10 Ft.	0 Ins.	" "	102 " 2 "		
" " Total Engine		26 Ft.	0 Ins.	Heating Surface (approximate) Fire Box			110 Sq. Ft.
" " Engine & Tender		47 Ft.	3 Ins.		Fire Brick Tubes		- "
Weight In Working Order (Approximate)	on Drivers		81,000 Lbs.		5-3/8" Tubes		278 "
	on F. Truck		15,000 Lbs.		2" "		703 "
	on B. Truck		13,000 Lbs.		Total		1091 Sq. Ft.
	Total Engine		107,000 Lbs.	Grate Area	16.5 Sq. Ft.	Ratio to Heat. Surf. 1 to	66
	Tender		110,000 Lbs.	Superheating Surface		222 Sq. Ft.	
Water Capacity	3,500 Gallons			Tractive Power (at .85 working pressure)			19,600 Lbs.
Fuel Capacity	1,200 Gallons			Ratio of Adhesion	4.13		

Limiting Conditions Grades 6%. Prevailing grades 1 to 3%.

Type generally illustrated by Photograph 7229



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DETAILS OF CONSTRUCTION

BOILER

Made of plates of homogeneous steel for a pressure of 200 lbs. per square inch, and tested with steam to at least 20 lbs. per square inch, above the boiler pressure, and with hot water to one-third above the boiler pressure. Safety valves set at 180 lbs. Working Pressure.
Waist 52 inches in diameter at smoke box end, made Extended Wagon top, with one dome placed forward of fire box Waist plates 9/16 inch thick.
All longitudinal seams Butt jointed, double covering strips.

Dome

Of open-hearth steel, pressed out in one piece, ~~or built up with separate top, base and body section.~~
Dome cap of forged steel.
Auxiliary dome N O N E

Tubes

Of Steel No. 9 wire gauge,
Of Tyler Diamond "T" Special Quality Charcoal Iron No. 11 wire gauge,
with copper ferrules and swaged at ends in firebox tube sheet.
15 in number 5⅜ inches in diameter, } and 13 feet 3 inches in length.
102 in number 2 inches in diameter, }

Fire Box

69-7/16 inches long and 34-1/4 inches wide inside, of homogeneous steel, side sheets 3/8 inch thick, back sheet 5/16 inch thick, crown sheet 3/8 inch thick, flue sheet 1/2 inch thick. Water space 3 inches sides and back, 4 inches front. Water space frame single riveted. Crown and side sheets in one piece.

Fire Brick Arch

N O N E Fire box lined with fire brick for oil burning.

Stay Bolts

Water space stay bolts of iron, screwed and riveted to inside and outside sheets.

Crown Staying

Radial stay bolts of iron, screwed through crown sheet and roof of firebox.

Boiler Covering

Boiler lagged with approved magnesia boiler covering, neatly jacketed with No. 22 U. S. Planished Steel and secured by iron bands.
Dome lagged with same material as boiler, with painted iron casing on body. Casing to have ~~cast~~ pressed steel ~~iron~~ bottom ring and cast iron or pressed steel top ring.

Boiler Fittings

Whistle One Blow-off cock Crosby, right side.
Safety valves Two CONSOLIDATED 3"
Blower valve, 7" ASHCROFT steam gauge Ironclad, and glass water gauge, with lamps, gauge cocks.

Feed Water

Supplied by Two MONITOR No. 7 (Lever Type) Injectors.

Superheater

Schmidt type superheater, placed in 5-3/8" tubes, connecting to top header in smoke box, and with outside steam pipe connections to valve chamber.
Royalty payable by The Baldwin Locomotive Works.

Cleaning Holes

Located where necessary for proper cleaning of boiler. Fusible plug located in crown sheet, and one spare fusible plug furnished extra.

Steam Pipes

Of iron, in smoke box. Dry pipe of steel, inside of boiler.

Throttle Valve

Balance poppet throttle valve of cast iron, in vertical arm of dry pipe.

Grates

Fire brick pavement in pan.

Ash Pan

With dampers suitably located front only.

Smoke Stack

Straight Stack.

Smoke Box

Extended, with deflecting plates, spark hopper and cleaning holes.

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CYLINDERS

Of close-grained iron, as hard as can be worked.
High pressure cylinders 16 inches diameter and 24 inches stroke.
Low pressure cylinders - inches diameter and - inches stroke.

Cylinder Heads
Of cast iron , neatly covered.

Main Valves
Type Piston Type - 8" diameter operating in suitable steam chests.

Cylinder Covering
Cylinders lagged with same material as boiler and neatly cased with painted iron.

Lubricator
NATHAN Five-Feed Bull's Eye automatic sight feed lubricator, placed in cab, and connected to steam chests by suitable pipes., of iron, under jacket.

Pistons
Heads of cast iron fitted with approved form of steam packing. Piston rods of steel, ground and keyed ~~or bolted~~ to crossheads, and securely fastened to piston heads.

Packing
Metallic packing for piston rods and valve stems UNITED STATES (King Type)

Guides
Of steel, fitted to guide yoke of mild wrought steel, or cast steel. Needle oil cups on guides

Crosshead
Of cast steel , with suitable bearings of cast iron, tinned.

Valve Motion
Walschaerts graduated to cut off equally at all points of stroke.

DRIVING WHEELS
S I X in number, 48 inches in diameter. Centers of cast steel turned to 42 inches diameter. Tires held by Shrinkage and Shoulder.

Tires
Of steel, 3 inches thick when finished; A L L pairs flanged 5-1/2 inches wide, ~~pair plain~~ ~~inches wide.~~

Driving Axles
Of hammered steel, journals { main 8 inches diameter and 9 inches long. others 8 inches diameter and 9 inches long.

Brass hub liners on driving wheels.

Driving Boxes
Of Cast Steel , with bronze bearings.
Equalizing beams of wrought steel or cast steel.

Rods
Connecting and Parallel rods of hammered steel. Connecting rods forged solid, and furnished with all necessary straps, keys and brasses. Parallel rods with ~~straps, keys and brasses or with~~ solid ends and heavy bronze bushings, put in by hydraulic pressure and well secured from turning in rod.
Grease cups forged on rods for compression grease.
Main rods "I" section.

Wrist Pins
Of Steel. Main and side rod wrist pin fastenings to be made with hexagon nuts on outside, suitably located.

FRONT ENGINE TRUCK
T W O wheeled truck
Truck frame of wrought steel or cast steel, well braced, fitted with swing bolster, with center bearing, ~~side bearing, or radiating mechanism.~~

Wheels
Cast Iron Spoke Center, Steel Tired wheels 28 inches diameter.

Axles
Of hammered steel, with journals 5 inches in diameter and 10 inches long.
Boxes of cast steel , with bronze bearings. Tires 2-1/2" x 5-1/2", held by bolted type fastening.

BACK ENGINE TRUCK
T W O wheeled truck
Truck frame of wrought steel or cast steel, well braced, fitted with swing bolster, with side bearing, ~~with center bearing, or radiating mechanism.~~

Wheels
Cast Iron Spoke Center, Steel Tired wheels 28 inches diameter.

Axles
Of hammered steel, with journals 5 inches in diameter and 10 inches long.
Boxes of cast steel , with bronze bearings. Tires 2-1/2" x 5-1/2", held by bolted type fastening.

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Engine Springs Of steel, tempered in oil.

FRAMES Of Cast Steel, securely braced and provided with front and back lugs for cylinder connections, and with pedestal caps fitted and bolted to bottom of pedestal. Rail washer on back of rear truck wheels.

Gibs and Wedges Of cast iron.

PILOT Of wood braced with iron.

Bumpers Front, of Wood Back, of bar steel

CAB Substantially built of steel, lined with wood well finished and substantially put together. Ventilator in cab roof.

Hand rails of iron.

Running boards of Steel Cab boards of Steel

Fixtures Engine furnished with Two sand boxes, bell and cord.

Headlight Two 16" round case headlights, fitted with Pyle-National Electric type K-2 incandescent electric equipment, with Ross special case, one front of engine and one back on swivel base on top of cab.

Power Brake Westinghouse-American outside equalized, combined automatic and straight air brake, Schedules No. 6-ET, WM-1 and 1012, on all driving and tender wheels, with train connections front and back. One 11" Air Pump.

Couplers Sharon M. C. B. Automatic Couplers, 15" knuckle face, 33-1/2" center above top of rail, at front of engine and rear of tender.

Sander Hand sanders, in each sand box.

Steam Heat N O N E

NOTE Locomotive, Baldwin Class 10-26½ D 157, Road Number 14, as built in 1919, for the Southern Pine Lumber Company.

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TENDER

Frame Substantially built of 8" and 10" Steel Channels, strongly braced

Tank Of steel, strongly put together, with angle iron corners and well braced.
Water capacity 3500 gallons of (231 cubic inches). Fuel capacity 1200 Gallons
Shape of tank "U" Shape - Straight Top

Trucks Two four-wheeled center bearing trucks, made with steel or iron side bars
Square wrought iron equalized trucks.

Bolsters Bolsters of Cast Steel

Additional bearings at sides of back truck

Springs Of steel, tempered in oil. Half-Elliptic - Standard Steel Works' make.

Wheels Chilled Cast Iron Plate wheels 33 inches diameter.
Brakes on all wheels.

Axles Of hammered steel, outside journals 4-1/4 inches diameter and 8 inches long.
Oil tight boxes, with bronze bearings.

Tool Boxes Of hard wood, fitted with locks and keys.

Drain pipe through coping on both sides of tender to drain top of tank.

Right 1" safety chains to be provided for tender trucks.

- o O o -

Cast steel deck plate with extra heavy drawbar connection between engine and tender, and steel chafing irons with 10" vertical face and long sweep to provide for extra rough service.

BRAKE DETAILS Large air reservoir capacity
Air pump to have U. S. Metallic Packing.

OIL BURNING ARRANGEMENT Baldwin Standard Oil burning arrangement, with burner placed in front end of fire box. Royalty, if any, payable by The Baldwin Locomotive Works.

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THE BALDWIN LOCOMOTIVE WORKS

Material Specifications

GENERAL

All material applied on this contract shall be of the best quality of its respective kind, and conform to the requirements of the American Society for Testing Materials (A. S. T. M.) as condensed in The Baldwin Locomotive Works specifications, and the following synopsis:

Boiler and Firebox Steel No. 130

The steel shall be made by the open-hearth process and shall be furnished in two grades, viz: Flange and Firebox. Each plate shall conform to the following chemical and physical requirements:

	Flange	Firebox
Carbon		0.12—0.25%
Manganese	0.30—0.60%	0.30—0.60%
Phosphorus (Acid Process) Not over	0.05%	0.04%
" (Basic ") " "	0.04%	0.035%
Sulphur	0.05%	0.04%
Tensile Strength—lbs. per sq. in.	55,000-65,000	52,000-62,000
Yield Point—Minimum lbs. per sq. in.	0.5 Tens. Str.	0.5 Tens. Str.
Elongation in 8"—Minimum per cent.	1,500,000 / Tensile Str.	1,500,000 / Tensile Str.

Firebox Copper No. 211

The copper shall be fire refined and hot rolled from cakes. One tension test and one bend test shall be made from each plate as rolled and shall conform to the following requirements. Arsenical copper shall contain 0.25 to 0.50 per cent. of Arsenic and shall not contain more than 0.120 per cent. of impurities.

Tensile Strength—lbs. per sq. in ..... Not under 31,000
Elongation in 8"—Minimum per cent 35

Tension test specimens shall be taken from full thickness plate as rolled and the thickness of each plate shall not be more than 0.04" under size ordered, and shall be free from injurious defects. A specimen shall bend both hot (500-700 C) and cold, 180°, without cracking on the outside of the bent portion for material not over 1" in thickness.

Staybolts-Iron No. 139

Iron shall be made wholly from re-worked puddled pig iron or re-worked knobbled charcoal iron, and shall be free from any admixture of iron scrap or steel. Iron shall conform to following physical requirements:

Tensile Strength—lbs. per sq. in ..... 48,000-52,000 Elongation in 8"—Minimum per cent 30
Yield Point—Minimum ..... 0.6 Tens. Str. Reduction of Area 48%

A test specimen shall bend cold through 180° flat on itself in both directions, without fracture on the outside of the bent portion. Bars shall be round, smooth, free from injurious defects and shall take a smooth, clean thread.

Staybolts-Copper No. 212

The copper shall conform to the same chemical and physical requirements as are given for copper plates for fireboxes. The bars shall be round and shall be free from injurious defects.

Lap-Welded and Seamless Steel Boiler Tubes No. 128

Steel shall be made by the open-hearth process and shall conform to the following requirements:

Carbon ..... 0.08—0.18% Phosphorus ..... Not over 0.04%
Manganese ..... 0.30—0.60% Sulphur ..... " " 0.045%

One flange, one flattening, one crush test shall be made from each of two tubes in each lot of 250 or less. Each tube shall be subjected to an hydrostatic test of 1000 lbs. per sq. in. for tubes under 5 inches diameter, and 800 lbs. per sq. in. for tubes 5 inches diameter and over.

Lap-Welded Charcoal Iron Boiler Tubes No. 138

Tubes shall be made from knobbled, hammered charcoal iron and shall be free from injurious defects and distortions.
One tube in each lot of 250 or less shall be tested and shall conform to the following physical requirements:
Each tube shall be subjected to an hydrostatic test of 1000 lbs. per sq. in. for tubes under 5 inches diameter, and 800 lbs. per sq. in. for tubes 5 inches diameter and over.
Hot bend, nick bend and crushing tests shall be made.

Seamless Brass Boiler Tubes No. 214

Tubes shall be drawn to size and semi-annealed. They shall be fully annealed at both ends if so ordered and shall conform to the following requirements:

Copper ..... Not under 69.00% Material other than copper and zinc ... Not over 0.50%
Lead ..... Not over 0.50% Zinc ..... Remainder
Iron ..... " " 0.10%

Test specimens taken from semi-annealed tubes shall be fully annealed for testing.
All tubes shall stand an internal hydrostatic pressure of at least 750 lbs. per sq. in. One flange and one flattening test shall be made from each of 2 tubes in each lot of 250 or less. Tubes shall be circular within 0.02" and shall be free from injurious defects.

Seamless Copper Boiler Tubes No. 213

Tubes will be furnished hard or annealed as specified.
All tubes shall stand an internal hydrostatic pressure of 750 lbs. per sq. in. This test should be made before the tubes are annealed.
One flange and one crush test shall be made from each of two tubes in each lot of 250 or less.
All specimens shall be tested cold.
All tubes shall be circular within 0.02" and shall be free from injurious defects.

Boiler Rivet Steel No. 131

Steel shall be made by the open-hearth process and shall conform to the following chemical and physical requirements:

Manganese ..... 0.30—0.50% Tensile Strength—lbs. per sq. in. 45,000-55,000
Phosphorus ..... Not over 0.04% Yield Point—Minimum lbs. per sq. in. 0.5 Tens. Str.
Sulphur ..... " " 0.045% Elongation in 8"—Minimum per cent. 1,500,000 / Tensile Str.
But not to exceed 30%

Carbon Steel Forgings Annealed No. 120

Forgings for carbon-steel driving axles, engine and trailing truck axles, main and side rods, straps, crank pins and piston rods shall be made of open-hearth steel and conform to the following chemical and physical requirements:

Manganese ..... 0.40—0.70% Phosphorus ..... Not over 0.05%
Sulphur ..... Not over 0.05%

SIZE OUTSIDE Diam. or Overall Thickness	Tensile Strength lbs. per sq. in.	Yield Point lbs. per sq. in.	Elongation in per cent. Not Under	Reduction of Areas per cent Not Under
Not over 8"	80,000	0.5 Tens. Str.	20	32
Over 8-12" inclusive	80,000	0.5 " "	19	30
" 12-20" "	80,000	0.5 " "	18	28

All such forgings to be annealed.
One tension test shall be made from each melt in each annealing charge.
Chemical analysis shall be made from each melt. One tension and one bend test may be made from each melt in each quenching charge. Tension and bend test pieces may be cut out from prolongations on a forging.

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Welding Steel Forgings No. 118

Mild steel forgings which may be welded or case hardened shall conform to the following requirements:

Manganese	0.30—0.55%	Elongation in 2"—Minimum per cent.	$\frac{1{,}500{,}000}{\text{Tens. Str.}}$
Phosphorus	Not over 0.05%		
Sulphur	" " 0.05%		
Tensile Strength—lbs. per sq. in	47,000-60,000	Reduction of Area—Minimum per cent.	$\frac{2{,}500{,}000}{\text{Tens. Str.}}$
Yield Point—lbs. per sq. in	0.5 Tens. Str.		

Wrought Iron Bars No. 141

Refined wrought iron bars shall be made wholly from puddled iron, free from any admixture of steel, and shall conform to the following minimum physical requirements:

Tensile Strength—lbs. per sq. in	48,000	Elongation in 8"	22%
Yield Point—lbs. per sq. in	25,000		

For material over 4 sq. in. in section area a reduction shall be allowed of 250 lbs. for each additional sq. in. in area.
No bar shall be used which shows a tensile strength less than 45,000 lbs. per sq. in.
Cold bend, hot bend and nick tests shall be made in accordance with A. S. T. M. Standards.

Tender and Engine Truck Axles No. 121

Steel shall be made by the open-hearth process and shall conform to the following requirements:

Carbon	0.35—0.55%	Phosphorus	Not over 0.05%
Manganese	Not over 0.70%	Sulphur	" " 0.06%

An analysis shall be made from each melt, and one drop test shall be made from each melt.

Bearing Metals

Bearings will be made from metal of composition "A" or "B":

	"A"	"B"		"A"	"B"
Copper	78 to 82%	69 to 73%	Zinc	Not over 2%	1%
Tin	8 to 12%	3.50 to 6.50%	Iron	" " 0.25%	0.25%
Lead	8 to 12%	22 to 26%	Other substances	" " 0.50%	0.50%

Steel Castings No. 127

Steel castings for the principal parts of locomotives, such as engine frames, wheel centers, etc., shall conform to the following chemical and physical requirements:

Phosphorus	Not over 0.05%	Sulphur	Not over 0.05%
Tensile Strength—lbs. per sq. in	70,000	Elongation in 2"	18%
Yield Point—lbs. per sq. in	0.45 Tens. Str.	Reduction of Area	25%

Coupons shall be attached to all important castings.

Cylinders No. 145

Cylinder castings to be of tough gray iron, close grained and cast in a dry mould. Standard arbitration bars, cast independently, shall show an average transverse strength of not less than 3200 lbs. and an average deflection of not less than 0.09 in. when placed horizontally on supports 12 inches apart. Drillings from transverse test bars shall show the following:

Phosphorus	Not over 0.90%	Sulphur	Not over 0.12%

Gray Iron Castings No. 148

Castings to be of tough gray iron, free from defects, and must show a sulphur content not exceeding 0.10% for medium castings and 0.12% for heavy castings.
Transverse tests on a standard arbitration bar shall show a minimum transverse strength of 2900 lbs. for medium castings and of 3300 lbs. for heavy castings.
In no case shall the deflection of a standard arbitration bar be under 0.10 in. when placed horizontally on supports 12 inches apart.
One transverse test to be made from each melt.

Springs No. 161, No. 162

All springs shall conform to the following chemical requirements:

Carbon	0.90—1.10%	Sulphur—Maximum	0.05%
Manganese—Maximum	0.50%	Silicon	0.25—0.50%
Phosphorus "	0.50%		

Springs shall be true to drawings, subject only to slight variations from the free and loaded heights, etc., specified in The Baldwin Locomotive Works' specifications.

Steel Tires No. 126

Steel tires shall be furnished in three classes.
Class A for driving tires for passenger locomotives.
Class B for driving tires for freight locomotives and tires for locomotive truck, tender truck, trailer and car wheels and miscellaneous service.
Class C for driving tires for switching locomotives.
The steel shall conform to the following requirements:

Carbon Class A	0.50—0.70%	Manganese	Not over 0.75%
Carbon Class B	0.60—0.80%	Phosphorus	" " 0.05%
Carbon Class C	0.70—0.85%	Sulphur	" " 0.05%
		Silicon	0.15—0.35%

	Class A	Class B	Class C
Tensile Strength—lbs. per sq. in	105,000	115,000	125,000
Elongation in 2"	12%	10%	8%
Reduction of area	16%	14%	12%

One analysis and one tension test shall be made from each melt. The test specimen is to receive approximately the same amount of work as the tire which it represents.

Chilled Wheels

Of approved make and of following guaranteed mileage:

For 28" wheels	40,000 miles	For 33" wheels	50,000 miles
For 30" wheels	45,000 miles	Other sizes in proportion.	

Adopted by joint committee Master Car Builders' Association, American Rwy. Master Mechanics' Association, and Association of Manufacturers of Chilled Car Wheels, November 21, 1889.
Deficient mileage will be adjusted upon the return of defective wheel, or that part of same containing the defect causing withdrawal from service. If preferred, wheels will be furnished subject to approved specifications and drop test without mileage guarantee.

Wrought Steel Wheels No. 157

Steel shall be made by the open-hearth process and shall conform to the following requirements:

	Acid	Basic		Acid	Basic
Carbon	0.60—0.80%	0.65—0.85%	Sulphur	Not over 0.05%	0.05%
Manganese	0.55—0.80%	0.55—0.80%	Silicon	0.15—0.35%	0.15—0.30%
Phosphorus	Not over 0.05%	0.05%			

An analysis shall be made from one wheel of each melt.

Structural Steel No. 110

Steel shall be made by the open-hearth process and conform to the following chemical and physical requirements:

Phosphorus	Not over 0.05%	Sulphur	Not over 0.05%
Tensile Strength—lbs. per sq. in			55,000-65,000
Yield Point—Minimum lbs. per sq. in			0.5 Tens. Str.
Elongation in 8"—Minimum per cent			$\frac{1{,}500{,}000}{\text{Tensile Str.}}$

One tension and one bend test to be made from each melt.

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THE BALDWIN LOCOMOTIVE WORKS

Standard Practices to Be Followed Unless Otherwise Specified

Boiler Construction

All boiler and fire box seams caulked inside and outside where possible. All holes reamed perfectly true after sheets are put together, holes slightly countersunk on inside and outside edges.

All caulking edges of plates planed where possible and caulked with round-pointed caulking tool, insuring plates against injury by chipping, in caulking with sharp-edged tools. All boiler brace jaws drop forged, with holes drilled. All rivet and pin holes in braces to be drilled. All jaw-pins to be turned to give full body bearing on both sides of jaw. All T-irons fastened to the interior of boiler shell to be accurately fitted to boiler. Tube-sheets to be thoroughly annealed and tube holes accurately reamed to gauges; sharp corners carefully rounded, to avoid cutting tubes in setting.

Throat sheet of sufficient thickness to prevent undue thinning where flanged. All parts well and thoroughly stayed. Liners on inside of side sheets, providing double thickness of metal for studs of expansion braces, when necessary.

Fire Box Construction

Fire door opening formed by flanging and riveting together the inner and outer sheets, except on small engines. Tool guard to be cast on lower part of fire door frame.

Provision to be made for vertical expansion of fire box tube sheet, if diameter of waist is 46 inches or over.

Outside and inside surfaces of water space frame, against which the sheets of the fire box and outer shell are riveted, to be machined smooth and fitted to gauges.

All water space stay bolts to have three-sixteenths-inch hole, one and one-quarter inches deep from outside, to indicate when broken in service. All stay bolt threads turned off between sheets.

Dome Construction

"One-piece": Pressed from single sheet of open-hearth steel, of sufficient thickness to prevent undue thinning where flanged; or if

"Built-up": To have top ring and bottom flange of seamless open-hearth forged steel, turned and accurately fitted to open-hearth steel body sheet before being drilled and riveted.

Dome base flange to be radially planed to fit the outer shell of boiler. All rivets connecting dome to boiler to be driven by hydraulic pressure.

Cylinders and Machinery

Cylinders accurately planed and fitted, and bolted together in the most approved manner. Valve face and steam chest seat raised above face of cylinder to allow for wear, except when piston valves are used. As far as possible, when placed horizontally, right and left hand cylinders to be reversible and interchangeable.

Valve motion: links, sliding-blocks, pins, lifting links and eccentric rod jaws to be well case hardened, or provided with hardened bushings. Sliding-blocks designed so as to give ample wearing surface. Rock-shafts and reverse-shaft of wrought iron or cast steel.

Lubrication of all bearings carefully provided for, and oil cups attached where required.

Finish and Equipment

Cylinder head covers of hydraulic forged steel. Steam chest bodies cased with painted iron, except when piston valves are used.

Cab to be provided with suitable windows and doors, conveniently arranged, and glazed with first quality double American crystal glass. Cab seats, cab seat cushions and an engineer's arm rest to be provided.

If for use in United States, ash pans, couplers, steps and hand-holds to be in accordance with the requirements of the Interstate Commerce Commission.

TOOLS: Two jack-screws and levers, one pinch-bar, with steel point and heel, suitable wrenches to fit all nuts and bolts on engine, including two monkey-wrenches, one set of driving-box packing tools, one machinist's hammer, one soft hammer, three cold chisels (two flat and one cape), and one engineer's torch.

CANS: One long spout quart oil can, one two-gallon oil can, one tallow pot.

FIRING IRONS: To suit fuel.

Painting

Engine and tender to be well painted and varnished. Lettering and numbering to be painted as specified by purchaser.

Case Hardening

All finished movable nuts made of steel, or iron case hardened.

Threads

All threads on bolts to be United States standard.

Gauges

All principal parts of engine accurately fitted to gauges and templets, and thoroughly interchangeable.

Patents

Builders not responsible for patented appliances specified by purchaser.

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BOILER FORM No. 4

B L. W. FORM 491
6M-4-15

THE BALDWIN LOCOMOTIVE WORKS

Specification Card for Locomotive No. 14

Owned by SOUTHERN PINE LUMBER CO. ~~Railroad Company~~

Operated by SOUTHERN PINE LUMBER CO. ~~Railroad Company~~.

Builder, The Baldwin Locomotive Works.
Builder's No. of Boiler 52359
When built SEPT. 1919.
Where built EDDYSTONE, PA.
Type of boiler EXT. WAGON TOP-RADIAL STAYED
Material of boiler shell sheets STEEL
Material of rivets STEEL
Dome, where located ON 3RD COURSE
Grate area in sq. ft. 16.5
Height of lowest reading of gauge glass above crown sheet 3½"
Height of lowest gauge cock above crown sheet 3½"
Water-bar tubes, O. diam. NONE thickness ---
Arch tubes, O. diam. NONE thickness ---
Fire tubes, number 15 & 102
" " O. diam. 5⅜" & 2" length 159"

Safety valves:

No.	Size	Make	Style.
2	3"	CONSOLIDATED	OPEN

Firebox stay bolts, O. diam ⅞" spaced 4" x 4½"
Combustion chamber stay bolts, O. diam. NONE
" " " " spaced -- x --
Crown stays, O. diam., top 1" bottom 1"
" " spaced 4" x 4"
Crow-bar rivets, O. diam., top NONE bottom NONE
" " " spaced -- x ---
Water space at firebox ring, sides 3"
back 3" front 4"
Width of water space at sides of firebox measured at center line of boiler, front 4⅛" back 5⅝"

Shell sheets:
Front tube ½" thick.
1st course 9/16" " 50⅞" I. diam.
2d " 9/16" " 52 TO 56" "
3d " 9/16" " 57⅛" "

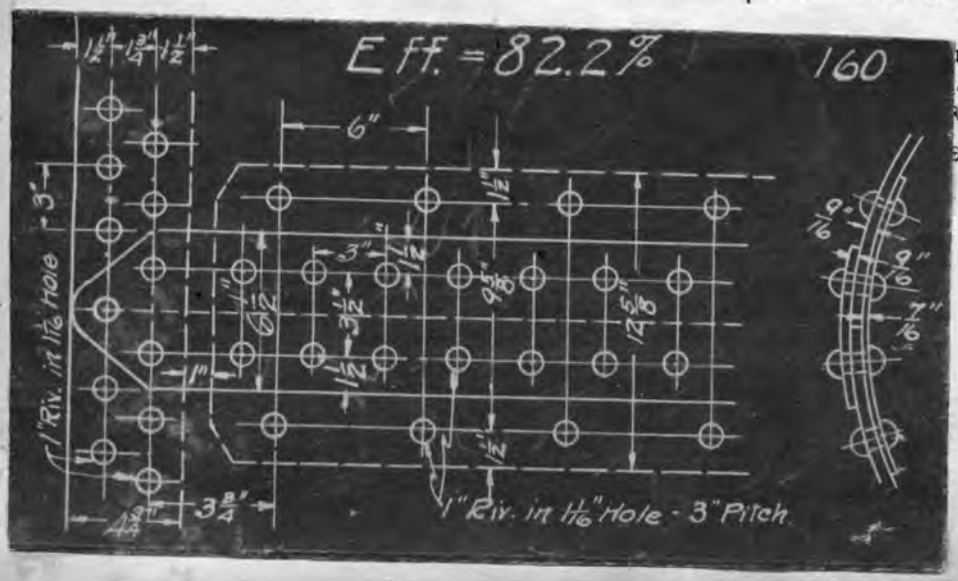
Mem: When courses are not cylindrical give inside diameter at each end.

Firebox:
Thickness of sheets—
Tube ½" Crown ⅜" Side ⅜"
Door 5/16" Combustion chamber NONE
Inside throat (if tube sheet is in two pieces) 1 PC

External firebox:
Thickness of sheets—throat 11/16" back head ½"
Roof 9/16" sides 9/16"
Dome inside diam. 29"
Thickness of sheet ¾" base 1" liner ½"

Were you furnished with authentic records of the tests of materials used in boiler? YES
Records on file in the office of the TEST DEPT.
of the BALDWIN LOCOMOTIVE WORKS ~~Company~~
show that the lowest tensile strength of the sheets in shell of this boiler is:
1st course 59100 pounds per sq. in.
2d " 62500 " " " "
3d " 62800 " " " "

Is boiler shell circular at all points? YES
If shell is flattened, state location and amount NOT FLATTENED
Are all parts thoroughly stayed? YES
Are dome and other openings sufficiently reenforced? YES
Is boiler equipped with fusible plugs? YES



umferential seams used in shell of boiler
ongitudinal seam. BOILER
R SQ. INCH.
S. PER SQ. INCH.

SEAM ON 1st & 2nd COURSES.

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THE BALDWIN LOCOMOTIVE WORKS

Specification Card for Locomotive No. 14

Owned by SOUTHERN PINE LUMBER CO. ~~Railroad Company~~

Operated by SOUTHERN PINE LUMBER CO. ~~Railroad Company~~.

Builder, The Baldwin Locomotive Works.
Builder's No. of Boiler 52359
When built SEPT. 1919.
Where built EDDYSTONE, PA.
Type of boiler EXT. WAGON TOP-RADIAL STAYED
Material of boiler shell sheets STEEL
Material of rivets STEEL
Dome, where located ON 3RD COURSE
Grate area in sq. ft. 16.5
Height of lowest reading of gauge glass above crown sheet 3 1/2"
Height of lowest gauge cock above crown sheet 3 1/2"
Water-bar tubes, O. diam. NONE thickness ---
Arch tubes, O. diam. NONE thickness ---
Fire tubes, number 15 & 102
" " O. diam. 5 1/2" & 2" length 159"

Safety valves:

No.	Size	Make	Style.
2	3"	CONSOLIDATED	OPEN

Firebox stay bolts, O. diam. 1" spaced 4" x 4 1/2"
Combustion chamber stay bolts, O. diam. NONE
" " " " spaced -- x --
Crown stays, O. diam., top 1" bottom 1"
" " spaced 4" x 4"
Crow-bar rivets, O. diam., top NONE bottom NONE
" " " spaced --- x ---
Water space at firebox ring, sides 3"
back 3" front 4"
Width of water space at sides of firebox measured at center line of boiler, front 4 1/8" back 5 3/8"

Shell sheets:
Front tube 1/2" thick.
1st course 9/16" " 50 7/8" I. diam.
2d " 9/16" " 52 TO 56" "
3d " 9/16" " 57 1/8" "

Mem: When courses are not cylindrical give inside diameter at each end.

Firebox:
Thickness of sheets—
Tube 1/2" Crown 3/8" Side 3/8"
Door 5/16" Combustion chamber NONE
Inside throat (if tube sheet is in two pieces) 1 PC

External firebox:
Thickness of sheets—throat 11/16" back head 1/2"
Roof 9/16" sides 9/16"
Dome inside diam. 29"
Thickness of sheet 1/2" base 1" liner 1/2"
Were you furnished with authentic records of the tests of materials used in boiler? YES
Records on file in the office of the TEST DEPT.
of the BALDWIN LOCOMOTIVE WORKS ~~Company~~
show that the lowest tensile strength of the sheets in shell of this boiler is:
1st course 59100 pounds per sq. in.
2d " 62500 " " " "
3d " 62800 " " " "
Is boiler shell circular at all points? YES
If shell is flattened, state location and amount
NOT FLATTENED
Are all parts thoroughly stayed? YES
Are dome and other openings sufficiently reenforced?
YES
Is boiler equipped with fusible plugs? YES

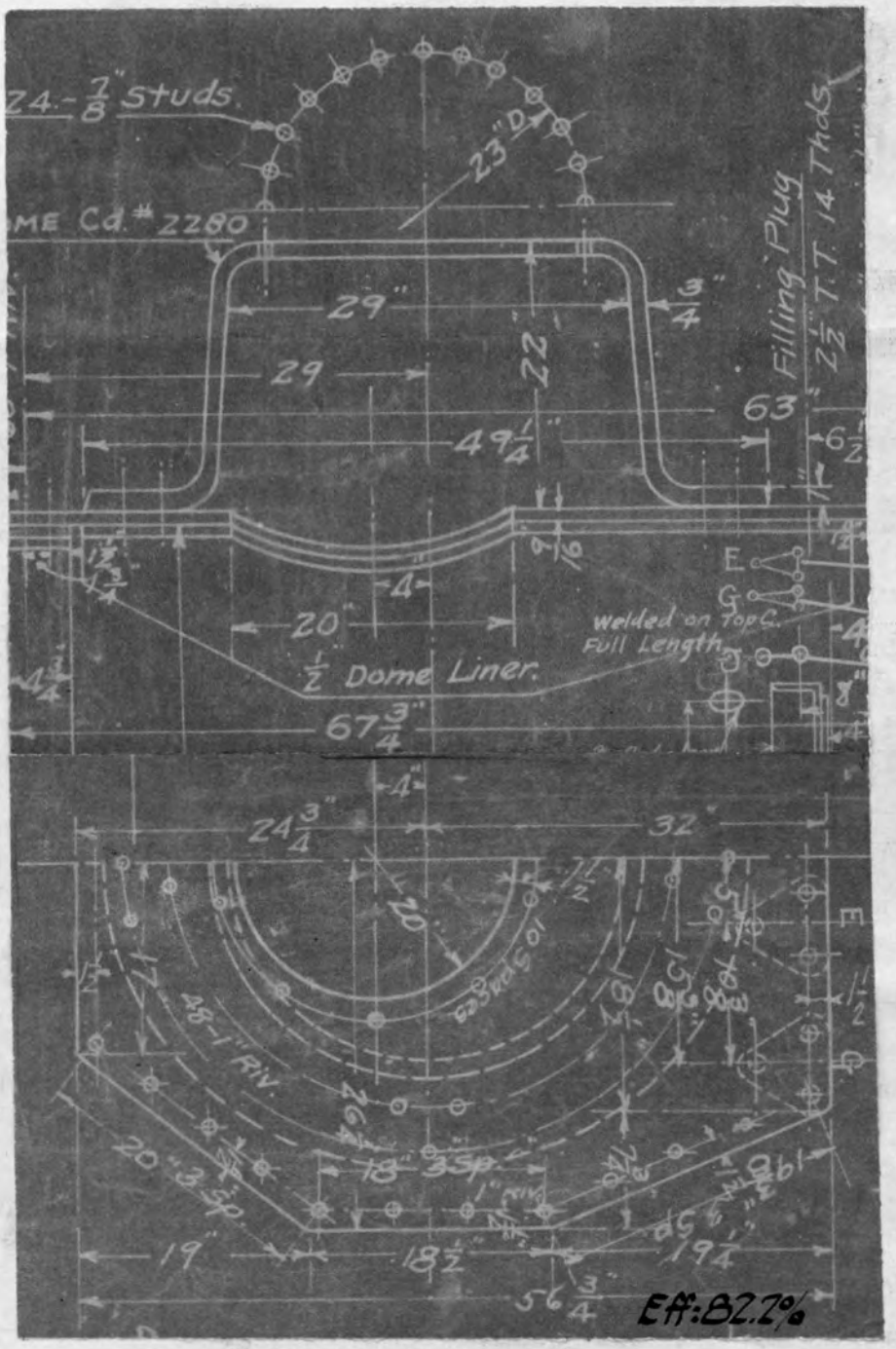
Make working sketch here or attach drawing of longitudinal and circumferential seams used in shell of boiler, indicating on which courses used, and give calculated efficiency of weakest longitudinal seam.

BOILER

TENSILE STRENGTH DOME 62000 LBS. PER SQ. INCH.
TENSILE STRENGTH DOME LINER 55000 LBS. PER SQ. INCH.

SEAM ON 1st & 2nd COURSES.

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SEAM ON 3rd COURSE.

HOLES FOR RIVETS $\frac{1}{16}$" LARGER THAN RIVET SIZES GIVEN.

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The maximum stresses at the allowed working pressure were found by calculation to be as follows:

Stay bolts at root of thread 7110 lbs. per sq. in
Stay bolts at reduced section 7470 " " " "
Crown stays ~~at root of thread or~~ smallest section, ~~at~~ 5320 lbs. per sq. in.
~~Crown stays at~~ crown-bar rivets ~~at root of thread or~~ smallest section ~~at~~ NONE lbs. per sq. in.

Round ~~and rectangular~~ braces 8560 lbs. per sq. in.
Gusset braces NONE " " " "
Shearing stress on rivets 7580 " " " "
Tension on net section of plate in longitudinal seam of lowest efficiency, pounds per sq. in. 12350

Dimensions and data taken from locomotive were furnished by .....

Data upon which above calculations were made were obtained from Drawing No. 13049 AND 13050

dated ..... furnished by THE BALDWIN LOCOMOTIVE ~~WORKS~~ ~~Company~~

Fred W. Grube
Mechanical Engineer.

STATE OF PENNSYLVANIA
COUNTY OF PHILADELPHIA } SS:

FRED W. GRUBE being duly sworn says that he is the officer who signed the foregoing specification, that he has satisfied himself of the correctness of the drawings and data used, and verefied all of the calculations, and has examined the record of present condition of boiler dated OCT. 7TH, 1919. and sworn to by inspector DAVID F. HERTZOG. and believes that the design, construction, and condition of boiler No. 52359 renders it safe for a working pressure of 200 pounds per square inch.

Fred W. Grube
(Name of affiant)

Subscribed and sworn to before me
this 9th day of October, 1919

Irvin M. Pfeffer
NOTARY PUBLIC
Notary Public.
My Commission Expires Jan. 22nd, 1921

Approved:

.....