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Eng 10-37285

File 250

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, September 11, 1911.
FW-HPH

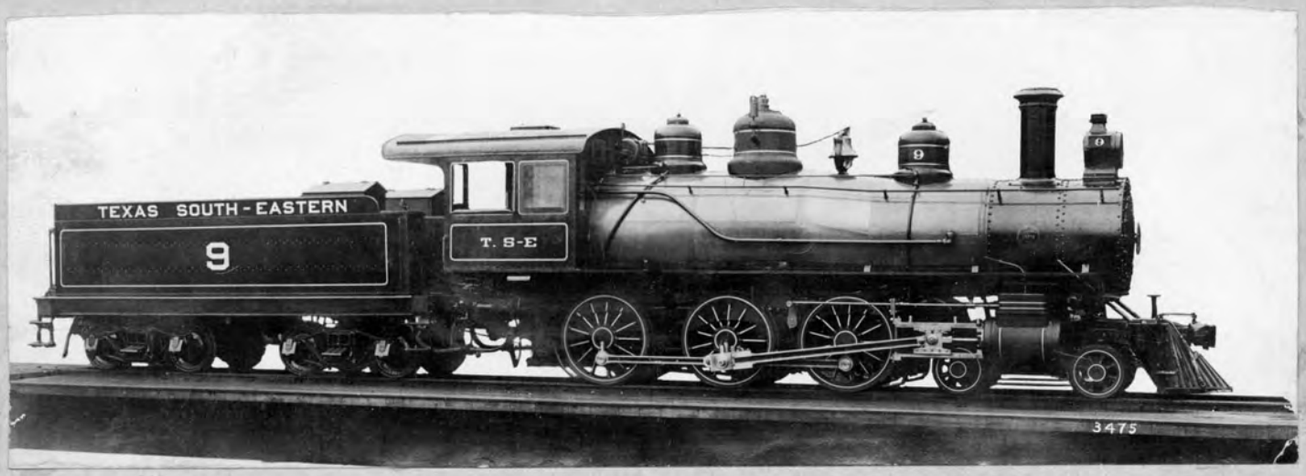
Class 10-30 D	SPECIFICATION NO. B-6002	Drawing No. 73

Of a Ten Wheeled Locomotive Engine having three pairs of coupled wheels and a four wheeled truck at front

for the TEXAS SOUTHEASTERN RAILROAD

This specification may be designated in cabling by code word -

Type generally illustrated by Photograph 3475



GENERAL DIMENSIONS

Gauge	4 Ft. 8½ Ins.	Fuel	Soft Coal		
Cylinders	-	Dia.	18 Ins.	Stroke	26 Ins.
Drivers, Diameter	56 Ins.	Working Pressure	200 Lbs.		
Boiler, Diameter	62 Ins.	Type	Ext. Wagon Top		
Fire Box	107 3/4 Ins.	Long	33 1/2 Ins.	Wide	
Tubes, No.	228	Dia.	2¼ Ins.	Length	13 Ft. 3 Ins.
Heating Surface (approximate,) Fire Box	152 Sq. Ft.				
	Tubes	1767 "			
	Total	1919 "			
Grate Area	25	Sq. Ft. Ratio to Heating Surface, 1 to	76		

Wheel Base, Driving	12 6	Ft.	0 Ins.
" Rigid	6	Ft.	1½ Ins.
" Total Engine	23		
" Engine & Tender	-	Ft.	- Ins.
Weight (approximate) on Drivers	107000 Lbs.		In Working Order
Total Engine	134000 Lbs.		
Tender	110000 Lbs.		
Tractive Power	25570 Lbs.	Ratio of Adhesion	4.1
Water Capacity	5500 Gals.	Fuel Cap.	10 tons

Headlight Pyle National electric headlight, with 18" round-case. See Suppt.

Power Brake Westinghouse-American outside equalized combined automatic and straight air brakes, Schedules No. 6-ET, WM-2, and 1212, on all driving and tender wheels, with train connections front and back. 11" air-pump. See Suppt.

Couplers Tower M.C.B. automatic couplers with 13" face, 33½" centre above top of rail, on engine and tender.

Steam Heat None Sander, Hand sanders, to sand front and rear of driving wheels.

Limiting Conditions None

Locomotive Class 10-30 D 609, Road No.10, as building.

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DETAILS OF CONSTRUCTION

Boiler

Made of plates of homogeneous steel for a pressure of 200 pounds per square inch, and tested with steam to at least 20 pounds per square inch above the boiler pressure, and with hot water to one-third above the boiler pressure.

Waist 62 inches in diameter at smoke-box end, made extended wagon top, with one dome placed forward of fire-box. : Waist plates 5/8 & 11/16 inches thick. All longitudinal seams butt jointed, with double covering strips.

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. No hand riveting permitted except where it is impossible to use power riveters. 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, and to be held in position by nut, washer and cotter-pin All T-irons fastened to the interior of boiler-shell to be machined accurately to fit the radius of 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, if side sheets are less than nine-sixteenths of an inch thick.

Dome

Dome-ring to be of seamless open-hearth forged steel, turned and accurately fitted to the interior of dome-sheet before being drilled and riveted. Dome-cap to be of forged steel. Dome-base to be of seamless open-hearth forged steel, flanged and radially planed to fit the outer shell of boiler. The interior bored to receive the body-sheet of dome. All rivets connecting dome to boiler to be driven by hydraulic pressure.

Tubes

Of Iron No. 12 wire gauge, with copper ferrules and swaged at ends in fire-box tube sheet 228 in number 2¼ inches in diameter, and 13 feet. 3 inches in length.

Fire-Box

To burn Soft Coal

107 3/4 inches long and 38 1/2 inches wide inside; of homogeneous steel, all flanged plates thoroughly annealed after flanging; side sheets 5/16 inch, back sheets 5/16 inch, crown-sheet 3/8 inch thick, flue sheet 1/2 inch thick. Water space 3 inches side and back, 4 inches front. 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. Water-space frame single riveted.

Stay-Bolts

Stay-bolts of iron, screwed and riveted to inside and outside sheets. All side stay-bolts to have three-sixteenth-inch hole, one and one-quarter inches deep from outside to indicate when broken in service. All stay-bolt threads turned off between sheets.

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.

Crown-Staying

Fire-brick arch supported on studs.

Crown-sheet supported ~~by crown-bars each made of two pieces of wrought iron, bearing on~~ side sheets, and stayed by braces to outside of boiler. Crown-sheet ~~held by~~ crown-bar bolts with head on under side of crown-sheet; or,

By I-bars ~~above crown~~ supported by braces from outside shell of boiler. The crown-sheet ~~held by crown-bar bolts with taper fit through crown-sheet and button head under crown-sheet.~~

By radial stay-bolts screwed through crown-sheet and roof of boiler, and riveted over. Central rows with heads below crown-sheet ~~on boilers 42 inches diameter and larger.~~ Provision to be made for vertical expansion of fire-box tube-sheet, ~~if diameter of waist is 46 inches or over.~~

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Cleaning Holes Cleaning plugs located where necessary for proper cleaning of boiler.

Steam-Pipes Of iron, in smoke-box. Dry pipe of wrought iron or steel, inside of boiler.

Throttle-Valve Balance poppet throttle-valve of cast iron, in vertical arm of dry pipe. See Suppt.

Grates Rocking bars and drop plate.

Ash-Pan With dampers suitably located See Suppt.

Smoke-Stack Straight stack, same as shown on Photograph 1611 (Class 10-32 D 718).

Smoke-Box Extended, with netting, deflecting plates, and spark hopper.

Frames Of cast steel securely braced and provided with front and back lugs for cylinder connections.

Pedestals Pedestals in one piece with main frames, and protected from wear of boxes by cast-iron gibs and wedges. Pedestal caps fitted and bolted to bottom of pedestals.

Engine Truck Centre-bearing swiveling four wheeled truck at front

Truck frame of wrought iron or cast steel, well braced; fitted with ~~swinging bolster or with~~ fixed centre bearing.

Wheels Cast iron spoke centre steel tired wheels 28 inches diameter.

Axles Of hammered steel, with journals 5½ inches in diameter and 10 inches long.

Springs Of steel, tempered in oil.

See Supplement.

Cylinders High pressure cylinders 18 inches diameter and 26 inches stroke.

Low pressure cylinders - inches diameter and - inches stroke.

Of close-grained iron as hard as can be worked. Each cylinder cast in one piece with half saddle. When placed horizontally right and left hand cylinders to be reversible and interchangeable, 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. Cylinders oiled by Nathan Triple Bulls Eye automatic sight-feed lubricator placed in cab, and connected to steam-chest by suitable pipes.

Pistons HEADS of cast iron, fitted with approved form of steam packing. PISTON-RODS of steel, ground and keyed or bolted to cross-heads, and securely fastened to pistons.

Packing Metallic packing for piston rods and valve stems UNITED STATES

Guides Of steel, fitted to guide-yoke of wrought iron or cast steel See Suppt.

Crossheads Cast steel with suitable bearings Alligator Type

Valve Motion Shifting link motion, graduated to cut off equally at all points of stroke. Links, sliding-blocks, pins, lifting-links and eccentric rod jaws to be well case hardened, or provided with hardened bushings. Sliding blocks with long flanges to give ample wearing surface. Rock-shafts and reverse-shaft of wrought iron or cast steel. See Suppt.

Steam-chest valves Balanced, with vacuum valves.

Driving Wheels Six in number, 56 inches in diameter. Centres of cast steel turned to 50 inches diameter.

Tires Of steel hardest grade 3 inches thick when finished; Middle and back pairs flanged 5½ inches wide, Front pairs plain 6½ inches wide.

Axles Of hammered steel; journals 8 inches diameter and 9 inches long.

Driving-Boxes Of cast steel, with bronze bearings See Suppt.

Springs Of steel, tempered in oil. EQUALIZING-BEAMS of wrought iron or cast steel. See Suppt.

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. Bushings put in by hydraulic pressure, and well secured from turning in rod See Suppt.

Oil Cups Lubrication of all bearings carefully provided for, and oil cups attached where required. ~~Wick, plunger or~~ adjustable needle oil-cups on ~~rods and~~ guides.

Wrist-Pins WRIST-PINS of steel. See Suppt.

Feed-Water Supplied by two Monitor, Lever Movement, injectors, No.8.

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Cab Substantially built entirely of steel well finished, and substantially fitted together. 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.

Pilot Of wood, braced with iron

~~**Steps**~~

Fixtures Engine furnished with two sand-boxes, bell and cord, extra fusible plug, engineer's torch.

BOILER FITTINGS: Chime Whistle, One blow-off cock, two 3" CONSOLIDATED safety-valves, blower-valve, One steam-gauge and glass water-gauge with lamps, gauge cocks.

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, and three cold chisels (two flat and one cape).

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

FIRING IRONS: To suit fuel.

Finish Boiler lagged with approved magnesia boiler covering, neatly jacketed with planished iron and secured by iron bands. Dome lagged with same material as boiler, with painted iron casing on body and cast iron top and bottom rings. Cylinders lagged with same material as boiler, neatly cased with iron, painted. Cylinder-head covers of hydraulic forged steel, painted ~~or polished.~~ Steam-chest bodies cased with painted iron, except when piston-valves are used.

Handrails of iron. Cab-boards and running-boards of ~~wood~~ steel. See Suppt.

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

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

Alloy All wearing brasses made of phosphor bronze, or ingot copper, lead and tin alloyed in proportion to give best mixture for wearing bearings.

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.

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

TENDER

Tank Tank of steel strongly put together with angle-iron corners and well braced. Top and bottom plates 5/16" thick, inside plates 1/4" thick, outside plates 1/4" thick, riveted with 1/2 inch rivets, 1-1/2 inches pitch.

Capacity 5500 gallons (of 231 cubic inches), Fuel capacity 10 tons

Shape of tank "U" shape, straight top.

Frame Tender frame substantially built of 10" steel channels, strongly braced.

Trucks Two four-wheeled centre bearing trucks, made with steel or iron side-bars and cross-beams of steel channels Arch bar trucks. Steel bolsters. Additional bearings at sides of back truck Elliptic Springs, cast steel, tempered in oil.

Wheels Cast iron spoke centre steel tired wheels 33 inches diameter. Brakes on all wheels.

AXLES of hammered steel; outside journals 5 inches diameter and 9 inches long. Oil-tight boxes with bronze bearings.

Tool Boxes Tool-boxes of hard wood, fitted with locks and keys.

For details of Tender see supplement attached.

(SEE SUPPLEMENT)

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SUPPLEMENT TO SPECIFICATION NO. B-6002

CLASS 10-30 D

FOR TEXAS NORTHEASTERN RAILROAD

HEADLIGHT	18" Pyle electric headlight case, with same electrical apparatus as furnished on Engine 9, Class 10-30 D 564. (R.R. reports that as near as they can determine, Builders furnished an oil-light case on former engines.
BRAKES	Brakes to be hung in front of drivers, and not in back as shown on Photograph 1611 (Class 10-32 D 718). R.R. prefers air reservoirs located as shown on Photograph 1611 (Class 10-32 D 718).
THROTTLE	Throttle to be placed same as on locomotives previously built by The B.L.W. for this road.
ASH PAN	Ash-pan to be of the self-cleaning type. On Engine 9, Class 10-30 D 564, the ash-pan slides were not wide enough to give sufficient lap to close opening in the pan, and R.R.Co. had to widen these slides. They have had trouble with the burning out of three grate bars which are immediately over that part of the ash-pan which is over the back axle. This space is necessarily contracted and R.R.Co. thinks provision should be made for the inlet of air around the top of the pan which now fits up tight against the mud ring. Boiler to be raised 4" to keep pan down which gives 4" more under the three grate bars mentioned. The R.R.Co. wants more air in the pan.
ENGINE TRUCK	Engine truck centre casting to be of cast steel. Apply extra large hubs on engine truck wheels with corresponding width of box. Engine truck wheel centres 23" diameter, with tires of hardest grade steel, 2-1/2" x 5-1/2", held by shrinkage and shoulder.
GUIDES	Two-bar type guides; same type as shown on Photograph 1611 (Class 10-32 D 718).
VALVE MOTION	R.R.Co. prefers short blades and long valve stems, as shown on Photograph 1611 (Class 10-32 D 718).
DRIVING BOXES	Elvin lubricators in driving boxes.
SPRING RIGGING	R.R.Co. reports trouble with spring gear on Engine 9, Class 10-30 D 564. They desire extra heavy springs with gear proportioned accordingly. Particular attention to be paid to having liberal clearances between spring gear and boiler and fire-box.
DRIVING RODS	Main rods fluted. Side rods fluted with solid ends. Rod oil-cups to be plunger and forged on rods; to be not less than 4-1/2" high, inside 2-1/2". Make sure cups are proper size for pins. On Engine 9, Class 10-30 D 564, rod oil-cups 4-1/2" high were too high and struck the reservoir. The boiler to be raised 4" to give additional clearance for spring rigging, and by so doing eliminate this trouble.
FLANGE OILER	Chicago Flange Oiler to lubricate front driving tires.
RAIL WASHER	Provide water pipes to wash sand from rails behind rear drivers.
WRIST PINS	R.R.Co. is not satisfied with the method of holding collar on crank pins and want us to arrange for the collar stud and double stud nuts to insure a secure fastening on locomotive now building.
RUNNING BOARDS	Running boards to extend full length of boiler.
CHAFING CASTING	Chafing casting of steel between engine and tender.
PAINTING	Letter locomotive same as Engine 9, Class 10-30 D 564. Locomotive to be numbered "10" in same location as Engine 9, Class 10-30 D 564, with number on back end of tender in addition.

(4-A) See Next Page

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SUPPLEMENT TO SPECIFICATION NO. B-6002

CLASS 10-30 D

FOR TEXAS SOUTHEASTERN RAILROAD

-: T E N D E R :-

TENDER DETAILS

Tender to be as long as is in good practice in order that it will not be too high. The additional tank capacity is desired in the length and not in the height.

Tender frame body bolsters of cast steel.

Tender truck wheel centres 28" diameter, with tires of hardest grade steel, 2-1/2" x 5-1/2", held by bolted type fastening.

Tender oil-boxes and lids to be same style as furnished on R.R. Co's. Engine 7, Class 10-24 D 51.

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PHYSICAL TEST OF MATERIALS

All materials used in the construction of the locomotive shall be of the best quality of their respective kinds, carefully inspected, and subjected to the following tests. Notwithstanding these tests, should any defects be developed in working, the corresponding part will be rejected.

Boiler and Fire-Box Steel

All plates must be rolled from steel manufactured by the open-hearth process, and must conform to the following chemical analysis:

	Boiler Steel	Fire-Box Steel
Carbon, between	0.15 and 0.25 per cent.	0.15 and 0.25 per cent.
Phosphorus, not over	0.05 "	0.03 "
Manganese, " "	0.45 "	0.45 "
Silicon, " "	0.03 "	0.03 "
Sulphur, " "	0.05 "	0.035 "

No sheets will be used that show mechanical defects. A test strip taken lengthwise from each sheet rolled should without annealing have a tensile strength of 60,000 pounds per square inch, and an elongation of 25 per cent. in a section originally 8 inches long. Sheets will not be used if the test shows a tensile strength of less than 55,000 pounds, or more than 65,000 pounds, per square inch, nor if the elongation falls below 20 per cent.

Fire-Box Copper

Copper plates for fire-boxes must be rolled from best quality Lake Superior ingots; they must contain at least 99.75 per cent. pure copper, and should have a tensile strength of 30,000 pounds per square inch, and an elongation of at least 35 per cent. in a section originally 2 inches long. Plates showing a tensile strength of less than 29,500 pounds per square inch will not be used.

Stay-Bolt Iron

Iron for stay-bolts must be double refined, and must show an ultimate tensile strength of at least 48,000 pounds per square inch, with a minimum elongation of 25 per cent. in a test section 8 inches long. Pieces 24 inches long must stand bending double both ways, without showing fracture or flaw. The iron must be rolled true to gauges furnished by The Baldwin Locomotive Works, and must permit of cutting a clean, sharp thread.

Copper Stay-Bolts

Copper stay-bolts must be manufactured from the best Lake Superior ingots; they must contain a minimum of 99.75 per cent. pure copper, and when annealed should have an ultimate tensile strength of 30,000 pounds per square inch, and an elongation of at least 35 per cent. in a section originally 2 inches long. Copper with a tensile strength of less than 29,500 pounds per square inch will not be used.

Boiler-Tubes

All boiler-tubes will be carefully inspected and must be free from pit-holes or other imperfection. Each tube must be subjected by the manufacturers, before delivery, to an internal hydraulic pressure of not less than 500 pounds per square inch. They must be rolled accurately to the gauge furnished by The Baldwin Locomotive Works, filling the gauge to a plump fit. They must be expanded in the boiler without crack or flaw, and must conform to the following test requirements.

Charcoal Iron

A test section 1¼ inches long, cut from any tube, must permit of vertical hammering without showing transverse cracks when flattened down.

Seamless Steel

All tubes must be drawn from steel manufactured by the open-hearth process and must conform to the following analysis:

Carbon	0.18 to 0.24 per cent.	Phosphorus not over	0.04 per cent.
Manganese	0.40 to 0.65 "	Sulphur "	0.05 "

A length of 1¼ inches, cut from any tube, must stand collapsing by vertical hammering without showing any cracks.

A length of 4 inches, cut from any tube, must stand horizontal collapsing until the sides meet without cracking.

Boiler-Tubes of Brass or Copper

Tubes of brass or copper to be of uniform circumferential thickness and solid drawn; to be perfectly round, and to resist an internal hydraulic pressure of 500 pounds per square inch. After annealing they must stand the following bending and flanging tests:

Brass and Copper Pipes

A length of 4 inches, cut from any tube, must stand being sawn lengthwise and doubled inside out without showing signs of cracks. Any tube must stand having one end flanged without cracking. The tube will be held in a die with the end to be flanged projecting. For tubes of diameters between 1⅞ and 2¼ inches this projecting end is to be five-eights of an inch long. For other diameters a proportinate length is to be flanged.

Bar Iron

Bar iron should have a tensile strength of 50,000 pounds per square inch, and an elongation of 20 per cent. in a section originally 2 inches long. Iron will not be used if tensile strength falls below 48,000 pounds nor if elongation is less than 15 per cent., nor if it shows a granular fracture.

Steel Tank-Plates

Tank-plates to be rolled from homogeneous steel billets, and must be of good finish and free from surface defects, such as spalling or bad buckling. The steel to be of such quality that pieces taken lengthwise of any plate shall show no signs of fracture when bent double while cold, over a mandrel whose diameter is one and a half times the thickness of plate so tested.

Steel for Forgings

All blooms for use in axles, pins, rods, guides, and similar forgings, must be made by the open-hearth process and be free from seams, slivers, and other surface defects.

Drillings will be taken from a point midway between the centre and the surface of the bloom, and must conform to the following specification when analyzed by The Baldwin Locomotive Works standard method:

Carbon, about	0.40 per cent.	Phosphorus, not over	0.05 per cent.
Manganese, not over	0.60 "	Sulphur, "	0.05 "

These blooms should be of such quality that a test piece, machined cold from a full-sized bloom of each heat used, has, when tested, an ultimate tensile strength of 80,000 pounds per square inch, and an elongation of 20 per cent. in a test section originally 2 inches long.

Blooms will not be used that show an ultimate tensile strength of less than 75,000 or more than 90,000 pounds per square inch, or an elongation of less than 15 per cent.

All forgings which develop seams or pipes upon machining will be rejected.

Chilled Wheels

Of approved make and of following guaranteed mileage:

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

(Adopted by Joint Committee Master Car Builders' Association, American Railway 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. Or, if preferred, wheels will be furnished subject to approved specification and drop test without mileage guarantee.

Spring Steel

All spring steel must be manufactured by the open-hearth or by the crucible process, and must be free from any physical defects. The metal desired has the following composition:

Carbon,	1.00 per cent.	Silicon, not over	0.15 per cent.
Manganese	0.25 "	Sulphur, "	0.02 "
Phosphorus, not over	0.03 "		

Steel will not be used which shows on analysis less than 0.90 or over 1.10 per cent. of carbon, or over 0.50 per cent. of manganese, 0.05 per cent. of phosphorus, 0.25 per cent. of silicon, or 0.05 per cent. of sulphur. A tempered bar resting upon supports 24 inches between centres must not take a permanent set of more than 0.05 inch after the first application of a load corresponding to a fibre stress of 135,000 pounds per square inch, nor more than 7.5 per cent. of the total deflection under 160,000 pounds fibre stress, nor any further set after five additional applications of a load giving a fibre stress of 150,000 pounds per square inch.

Phosphor-Bronze

All bronze to be made from new metals and should show the following analysis:

Copper,	79.70 per cent.	Lead,	9.50 per cent.
Tin,	10.00 "	Phosphorus,	0.80 "

Bronze will not be used should analysis show results outside the following limits:

Tin,	below 9.00 per cent.	or	over	11.00	per cent.
Lead,	" 8.00 "		"	11.00	"
Phosphorus,	" 0.70 "		"	1.00	"

Bronze will also be rejected in case it contains 0.50 per cent. of any substances other than the four elements mentioned in this specification.

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THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA, PA.

Specification No. B-6002

OF A

TEN WHEELED

LOCOMOTIVE ENGINE

Class 10-30 D

FOR

TEXAS SOUTHEASTERN RAILROAD

1993:022