

C. P. A. A. R.  
MISSION FRANCE  
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THE BALDWIN LOCOMOTIVE WORKS  
&  
**AMERICAN LOCOMOTIVE COMPANY**

**SPECIFICATION**

NO. A-13358

CODE WORD AVITUALLAR

FOR THE FRENCH SUPPLY MISSION

22" x 30"      2104-S-340      Ten-Coupled Type Locomotive

THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA, PA.  
 AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET

NEW YORK

SPECIFICATION NO.

A-13358

CODE WORD

AVITUALLAR

JULY 27,

19 44

OF A

Ten-Coupled Type

LOCOMOTIVE,

TYPE

2104-S-340

FOR

THE FRENCH SUPPLY MISSION

GAUGE OF TRACK	CYLINDERS		DRIVING WHEELS DIAMETER	BOILER		FIRE BOX		TUBES				
	DIAMETER	STROKE		DIAMETER	PRESSURE (POUNDS)	LENGTH	WIDTH	NUMBER	DIAMETER	LENGTH		
4'-8 1/2"	22"	30"	59"	76" O.D. 87" O.D.	256	120-1/8"	84 1/2"	129 50	2 1/2" 5 1/2"	19'-0"		
APPROXIMATE WEIGHT IN WORKING ORDER—(POUNDS)												
WHEEL BASE		ENGINE		ENG. & TEND. ABOUT		LEADING		DRIVING		TRAILING	ENGINE	TENDER
21'-0"		42'-2"		75'-6"		35,000		220,000		85,000	340,000	160,000
FUEL KIND	EVAPORATING SURFACES—(SQUARE FEET)					SUPER HEAT SURFACE SQ. FT.	GRATE AREA SQ. FT.	MAXIMUM TRACTIVE POWER (POUNDS)	FACTOR OF ADHESION			
	TUBES	FLUES	FIRE BOX	ARCH TUBES	TOTAL							
Coal	1,437	1,362	316	30	3,145	1,150	70.3	53,500	4.11			
LIMITATIONS												
79'-0" turntable.												
WEIGHT PER AXLE	WEIGHT ON DRIVERS	WEIGHT TOTAL	WIDTH	WHEEL BASE TOTAL	LENGTH OVER ALL	HEIGHT ABOVE RAIL						
						STACK	TENDER FILL'G HOLE					
44,000	220,000	Berne Clearance Diagram - 3% Max. Grade										

TENDER, TYPE 8-wheel CAPACITY, WATER 8,000 U.S. GALLONS. FUEL 12 U.S. Tons

GENERAL DESIGN SHOWN BY Preliminary Diagram 985-N-6890.

Design is new and is based on conference with The French Supply Mission representatives in New York on July 20, 1944.

## BOILER AND BOILER FITTINGS

Boiler	<p>Boiler type <b>conical</b></p> <p>of waist at front end <b>76"</b>, largest course <b>87"</b> <span style="float: right;">outside <del>inside</del> diameter</span></p> <p>homogeneous boiler steel. Dome well secured to boiler. Shell thoroughly reinforced at opening.</p> <p>Boiler well designed, thoroughly braced and stayed, of best workmanship, and capable of carrying with a factor of safety of 4%, a working pressure of <b>256</b> lbs. per square inch.</p> <p>Boiler tested, with steam to 20% and with hot water to 25% above working pressure.</p> <p>Horizontal seams Butt jointed, Multiple riveted, with welt strips inside and outside.</p> <p>Plates planed at edges and caulked. <b>Sloping backhead and throat.</b></p> <p>Rivet holes reamed after assembling, to insure uniform holes, and slightly counter-sunk under heads of rivets.</p> <p><b>Fusible plugs in crown sheet.</b></p>										
Fire Box	<p>Fire box of homogeneous fire box steel, <b>welded construction.</b></p> <p>Length inside <b>120-1/8"</b> width inside <b>84-1/4"</b></p> <p>Thickness of crown sheet <b>3/8"</b>, tube sheet <b>1/2"</b>, sides <b>3/8"</b>, back <b>3/8"</b></p> <p>Water space front <b>5-1/2"</b>, sides <b>5"</b>, back <b>5"</b></p> <p>Combustion Chamber length <b>56"</b></p>										
Mud Ring Staybolts	<p>Mud ring accurately fitted and substantially <b>double riveted. of cast steel</b></p> <p>Staybolts of wrought iron, of ample diameter, screwed and riveted to sheets, suitably spaced from center to center, and pneumatically driven. Tell tale holes drilled in outer ends.</p> <p>Crown sheet supported by radial stays of wrought iron, body of ample diameter with enlarged ends, screwed through the crown and shell and riveted over. Flexible expansion stays at front of firebox. Approx. <b>54</b> in number.</p>										
Staybolts Flexible	<p><b>Flexible stays, 3-piece type with welded sleeves.</b> Approx. <b>924</b> in number.</p> <p>Flexible water space staybolts <b>in breaking zone</b></p> <p>Flexible radial staybolts ( <b>two</b> rows each side of fire box ) Approx. <b>168</b> in number.</p>										
Superheater Mud Drum Tubes Flues	<p>Fire tube type <b>"A"</b> to give steam temperature of <b>400°C (420°C max.)</b></p> <p><b>Located on under side of first course.</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 15%;">129</td> <td style="width: 45%;">tubes of seamless steel</td> <td style="width: 15%;">2-1/4" outside diameter</td> <td style="width: 10%;">#12</td> <td style="width: 15%;">B. W. G. thick (min.)</td> </tr> <tr> <td>50</td> <td>flues of seamless steel</td> <td>5-1/2" outside diameter</td> <td># 8</td> <td>B. W. G. thick "</td> </tr> </table> <p><b>19'-0"</b> long, set with copper ferrules at fire box end. tube spaces.</p> <p><b>Tubes and flues to be welded in back tube sheet.</b></p>	129	tubes of seamless steel	2-1/4" outside diameter	#12	B. W. G. thick (min.)	50	flues of seamless steel	5-1/2" outside diameter	# 8	B. W. G. thick "
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Fire Brick	<p>Fire brick arch supported on <b>four 3-1/2" arch tubes.</b></p>										
Cleaning Holes	<p><b>Hand holes</b></p> <p><del>Waterways</del> provided at corners of fire box, above fire door and crown sheet, and for washing boiler shell.</p>										
Blow-off Cock	<p>Blow-off Cock. <b>two - one on each side of firebox.</b></p>										
Safety Valves	<p>Safety Valves of ample capacity. <b>three - 3" (one muffled and two open).</b></p>										
Water Supply	<p>Furnished by <b>One</b> injector of ample capacity. <b>Non-lifting, one motion type.</b></p>										
Feed Water Heater	<p><b>One open type.</b></p>										
Throttle	<p>Balanced throttle valve <b>multiple</b> type, with steel dry pipe and cast <b>steel</b> steam pipes to cylinders.</p> <p>Outside steam pipes.</p>										
Stoker	<p><b>Mechanical stoker to be applied.</b></p>										
Firedoor	<p><b>To open inward.</b></p>										
Grates	<p>Cast iron rocking bars suitable for fuel. <b>with drop grate at front end.</b></p>										
Ash Pan	<p>Ash pan of steel plate. <b>with suitable flush pipes.</b></p>										
Smoke Box	<p>Smoke box extended and fitted with netting and deflecting plates. Front and door of pressed steel, carefully fitted.</p>										
Smoke Stack	<p>Smoke stack of cast iron, designed to give maximum draft. <b>Variable exhaust nozzle.</b></p>										

**FRAMES, CYLINDERS, ETC.**

**Firebox supported by waist sheets - no shoes.**  
~~Frames thoroughly braced to boiler by suitable expansion members.~~

**Frames** Frames thoroughly braced ~~to boiler~~ to boiler by suitable ~~expansion~~ expansion members. Pedestals protected from wear by **cast steel shoes** and adjustable wedges, and securely fastened together at bottom by caps lugged and bolted to bottom of pedestal. **Automatic wedges; brass faced shoes.**  
**Cast steel bed frame with integral cylinders and cradle.**

**Cylinders** Cylinders, diameter **22"**, stroke **30"**, ~~Water relief valves in cylinder heads.~~ **Water relief valves in cylinder heads.**  
~~Ample steam & exhaust passages. Cast steel cylinder heads.~~  
**Ample steam & exhaust passages. Cast steel cylinder heads.**

**Cylinder Bushings** Cylinder bushings of **gun iron.**

**Pistons** Pistons of cast steel **"2" type** made with solid heads, and fitted with **three** cast iron packing rings. Piston rods of hammered steel, of ample diameter, securely fastened to pistons and cross heads.

**Valves** Steam chest valves: **12" piston type.**

**Valve Motion** **Walschaert** Valve motion graduated to cut off equally at all points of the stroke. Detail parts of soft steel with case hardened wearing surfaces. Bushings of bronze or soft steel case hardened.

**Reverse Gear** Reverse gear. **Power (air) reverse gear - left hand drive.**

**Rod Packing** Metallic packing on piston rods **and** valve stems

**Guides** Guides **multiple bearing** type, of steel, securely bolted to cylinder heads and to rigid guide yoke extending across frames.

**Crossheads** Crossheads **multiple bearing** type, of cast steel with ample bearings.

**DRIVING WHEELS, RODS, ETC.**

**Driving Wheels** Driving wheels, number **10**, diameter **59"**, diameter centers **52"**, carefully proportioned and accurately counterbalanced. Main centers of **cast steel**. Hub liners of **bronze**. Other centers of **cast steel**.

**Tires** Tires of open-hearth steel **3-1/2"** thick. Flanged tires **on all drivers** **5-1/2"** wide.  
~~Retaining rings on all wheels.~~ **Gibson type retaining rings on all wheels.**

**Axles** Axles of hammered open-hearth steel finished in best manner. Main journals, diameter **10-1/2"**, length **12"**. Other journals, diameter **9"**, length **12"**.

**Boxes** Main driving boxes of **cast steel**. Other driving boxes of **cast steel** with deep flanges and large **oil** cellars, and carefully fitted with heavy bronze bearings arranged with suitable grooves. **and Babbitt lined.**  
**Lateral motion device on #1 drivers.**

**Springs** Driving springs of open-hearth steel, tempered in oil, and secured to a system of equalizing beams to insure the engine riding in the best possible manner.

**Rods** Connecting rods of hammered open-hearth steel, fitted with **solid** bronze **bushings**, I-section. Parallel rods of hammered open-hearth steel with bronze bushings. **Rectangular, deep section.**

Crank Pins Crank pins of hammered open-hearth steel with ample bearing surfaces.

Lubrication All bearings on engine provided with suitable means for their proper lubrication, adjustable oil cups on guides and suitable oil ~~mechanical~~ cups on rods. (Plunger type) ~~mechanical~~ lubricator.  
Cylinders and valves ciled ~~mechanical~~ by lubricator.  
**Mechanical lubricator feed connection to the top of each driving box.**

## TRUCKS

Leading Truck Type **radial, inside bearing.**  
Frame of ~~cast steel~~ cast steel  
Boxes of cast **steel** with ~~roller bearings~~ roller bearings  
Axles of hammered open-hearth steel. Journals, diameter and length **7" x 12" nominal size.**  
Wheels, number **2**, diameter **36"** with cast steel centers and **3-1/2" x 5-1/2"** steel tires and Gibson retaining rings.

Trailing Truck Type **radial outside bearing.**  
Frame of ~~cast steel~~ cast steel  
Boxes of cast **steel** with ~~roller bearings~~ roller bearings.  
Axles of hammered open-hearth steel. Journals, diameter and length **7 1/2" x 12" nominal size.**  
Wheels, number **4**, diameter **42"** with cast steel centers and **3 1/2" x 5 1/2"** steel tires and Gibson retaining rings.

## ~~TRUCKS~~

### CAB, PILOT AND FIXTURES

Cab Cab substantially built of **steel plate; roof wood lined** ; thoroughly braced and secured to boiler and running boards, furnished with suitable sliding windows, and with convenient tool boxes, seats, cushions and arm rests for engineer and fireman.

Running Boards Running boards of **steel plate**

Bumper Front bumper of **cast steel (bolted to frames)**  
**Arranged for future application of M.C.B. couplers.**  
~~xxxx~~ Suitable rail guards applied (front and rear).

~~xxxx~~  
Coupler **Screw link and twin buffer type.**

Sand Box **Two** Sand boxes of ample capacity arranged with suitable valves and pipes.

Sander **Pneumatic - front of No. 1 and 3, and back of No. 5 drivers.**

Headlight Headlight **Three lamps front of engine - brackets only rear of tender.**  
**Electric lighting equipment to be applied.**

Fixtures Engine provided with support for headlight, ~~xxx~~ cast iron whistle, steam gauge, gauge cocks, glass water gauge, blower, cab lamps.

Speed Indicator **Apply speed indicator without recording device.**

## ~~xxxx~~

Tools Engine provided with all necessary wrenches, firing tools, hammer, chisels, packing tools, one jack screw, one scoop shovel, oil cans and torch. **two traversing jacks.**

Templates Principal parts of engine fitted to gauges and templates, and interchangeable.

Bolts and Nuts All bolt threads U. S. Standard, except where finer threads are necessary. All finished removable nuts case-hardened. Fittings manufactured outside to have makers' standard threads.

Hand Rails Hand rails of iron or steel conveniently arranged and securely fastened.

**TENDER**

Frame *Frame substantially built of cast steel, water bottom type.*  
 Arrange for future application of M.C.B. couplers.

Coupler *Coupler Screw link and twin buffer type.*

Draft Gear *Draft Gear arrange for future application.*

Trucks *Two four-wheel center bearing trucks, with heavy bolsters. Cast steel side frames.*

Axles *Axles of hammered steel. Journals, diameter and length 6" x 11"*

Wheels *Wheels, number 8, diameter 37-3/4" O.D. with cast steel centers and 3 1/2" x 5 1/2" steel tires and Gibson retaining rings.*

Springs *Springs of open-berth steel tempered in oil. elliptic type.*

Brake *Brake on both trucks with suitable brake beams.*

Tank *Tank type rectangular made of steel plates strongly riveted together, with angle iron corners, thoroughly braced and stayed, and well secured to tender frame.*  
 Coal gates of **steel plate**  
 Water capacity **8,000** U. S. Gallons (231 cubic inches)  
 Coal capacity **12** tons (2000 lbs.)

Tool Boxes *Tool boxes of steel plate*

**GENERAL FINISH**

General Finish *Cylinder casings of sheet steel, with pressed steel painted head covers. Steam chest body casings of sheet steel with pressed steel covers.*

Lagging *Boiler lagged with sectional magnesia.*  
*Cylinders lagged with sectional magnesia.*

Jacket *Boiler jacket of sheet steel neatly secured by bands and painted. Boiler Jacket #18 B.W.G. thick. Supported on lagging.*  
*Back head lagged and jacketed.*  
**Smokebox lagged and jacketed.**

Painting *Engine and tender well painted and varnished, with marking and numbers, as specified by Purchaser.*

Patents *All patent fees not covered by this specification excepted.*

**BRAKES AND SPECIALTIES**

Brakes *Automatic air brakes on engine and tender, suitable train connections.*  
 Operating brake schedule: **automatic and straight air in locomotive with H-7 brake valve.**  
 Air pump **one 8 1/2" cross compound located on front deck.**  
 Main reservoirs of ample capacity.  
 Foundation brake, drivers, style **equalized**  
~~trailing truck, style~~  
 trailing truck, style **equalized on all four wheels.**  
**Le Chatelier water brake.**  
 Automatic air brake train line connections front and rear.  
 All brake applications single shoe type.

Radial Buffer *Between engine and tender.*

Safety Bars *Between engine and tender.*

Boiler Boiler barrel plates to be carbon-silico steel having 70,000 lbs. tensile strength.

Frames If specified cast steel beds are not available in necessary quantity for scheduled deliveries, an alternate design of cast steel bar type frames with one-piece cast steel cylinders may be used.

Tender Frames If specified cast steel tender frames are not available in necessary quantity for scheduled deliveries, an alternate design of rolled steel shapes may be used, making frame open type with water bottom tank.

Roller Bearings If specified roller bearings are not available for scheduled deliveries, suitable plain bronze bearings of the size specified may be used with suitable bronze hub liners in wheels.

Speed Recorder If specified speed recorder is not available for scheduled deliveries, the engines are to be arranged for its future application and the device itself is to be omitted.

Design The Locomotive Builders' standard practice for:  
 Design  
 Construction  
 Finish and Methods of Manufacture

for U. S. locomotives are to govern these locomotives throughout, following purchaser's standards for:  
 Couplers  
 Train Connections  
 Clearances

All details to be designed to the English System of Measurements and the drawings will show only English dimensions and will be made to Builders' Standard sizes.

All bolt and pipe threads and fittings to have Builders' Standard threads as standard in the United States.

Materials All material and specialties to be of U. S. manufacture and to comply with all U. S. Emergency Requirements in force at the time of scheduling these locomotives for delivery and, except as specified, to be of open make.

Inspection Locomotive Builders' Inspection to govern these locomotives throughout for Design, Material and Workmanship.

SPECIALTY

MANUFACTURER

Flexible staybolts	Open
Superheater	The Superheater Co.
Firebrick	American Arch Co.
Blow-off Cock	Builder's Standard
Safety Valves	Open
Injectors	Nathan or Sellers "SY"
Feed Water Heater	Worthington
Throttle	The American Throttle Co.
Mechanical Stoker (Type "HK")	The Standard Stoker Co.
Grates	Hulson
Exhaust Nozzle	Kylchap (Shop Made)
Frames (Bed Frame)	General Steel Castings Corp.
Gun Iron Bushings	Hunt-Spiller Corp.
Power Reverse Gear	Builders' Standard
Rod Packing (Metallic)	Open
Driving Wheel Centers (Boxpok)	General Steel Castings Corp.
Lubricator	Nathan, or equivalent
Roller Bearings (Engine Truck)	Open
Roller Bearings (Trailing Truck)	"
Sander	"
Electric Lighting Equipment	Pyle-National, or equivalent
Electric Lights (Lamps)	Open
Speed Indicator	"
Traversing Jacks	"
Tender Frame	General Steel Castings Corp.
Brakes	Westinghouse
Automatic Driving Box Wedges	Franklin
Radial Buffer	"



**DESIGN, PRELIMINARY**

2104 S 340 CLASS  
 THE BALDWIN LOCOMOTIVE WORKS  
 AMERICAN LOCOMOTIVE COMPANY  
 JULY 27, 1944

**985N6890**

<b>CARD</b>	ORIGINAL ORDER NO.
<b>N6890</b>	PROJECT SUBJECT

