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Hands off

BUDD

RAIL DIESEL CAR

GENERAL MANUAL

OCTOBER 1, 1962

THE BUDD COMPANY
CUSTOMER SERVICE DEPARTMENT
RED LION PLANT
PHILADELPHIA 15, PA.

FOREWORD

This illustrated Manual is supplied by The Budd Company for the Budd Rail Diesel Car and explains those service and preventive maintenance operations that logically fall within the scope of the mechanical department maintenance forces.

The Manual is divided into sections. Each section fully describes all systems and the necessary maintenance procedures.

Information concerning replacement parts can be obtained from THE BUDD COMPANY, Customer Service Department, Red Lion Plant, Philadelphia 15, Pennsylvania.

CONTENTS

For items not included in the above table of contents, refer to Vendor's Bulletin reference list.

VENDORS' BULLETIN REFERENCE LIST

Vendors' bulletins as follows must be used to supplement information as contained in this manual. Obtain quantity required from the respective vendors.

Air Brake & Sanding Equipment

New York Air Brake Co.
230 Park Ave.
New York 17, N.Y.

Air Compressor

Westinghouse Air Brake Co. — Form 9352-3 & Repair Specification R-26-C

Air Compressor Motor

Safety Electrical Equipment Co. — Form 4816A-8-56
1187 Dixwell Ave.
New Haven 14, Conn.

Air Conditioning

Safety Electrical Equipment Co. — Form 4993-5-58
Form 4229A-55

Bell Ringer

The Prime Manufacturing Co.
Milwaukee 4, Wis. — Bulletin No. S44A

Budd Disc Brake

The Budd Company
Philadelphia 15, Pa. — Manual & Parts Catalog DB-54

Drive Shaft - Main

Dana Corporation
Toledo 1, Ohio — Bulletin No. 8302

Drive Shaft - Generator

Dana Corporation
Toledo 1, Ohio — Bulletin No. 8302

READING CO.

Engine & Transmission	
Detroit Diesel Engine Division General Motors Corp. 13400 West Outer Drive Detroit 28, Michigan	6-110 Maintenance Manual Form 6SE197
Excitation Equipment	
Barth Engineering & Mfg. Co. 48 Elm Street Meriden, Conn.	
Fuel Fill System	
The Houston Company 266 Sand Bank Road Cheshire, Conn.	H-1020 Automatic Refueling System
Generator	
Safety Electrical Equipment Co.	Form 4816A-8-56
Generator Regulator	
Safety Electrical Equipment Co.	Form 4816A-8-56
Journal Bearings	
SKF Industries	Maintenance - SKF Cylindrical Roller Bearings.
Lamp Regulator	
Safety Electrical Equipment Co.	Form 4816A-8-56
Reverse Current Relay	
Safety Electrical Equipment Co.	Form 4816A-8-56
Rolokron Anti-Wheel Slide Equipment	
The Budd Company Philadelphia 15, Pa.	Manual & Parts Catalog B-56
Water Cooler	
Ajax-Consolidated Co. 4607 West 20th Street Chicago 50, Ill.	Bulletin #192

Windshield Wiper Equipment

Sprague Devices, Inc. Michigan City, Ind.	Air-Push Windshield Wipers - Maintenance Manual

Car Lifting Data

American Chain & Cable Co. Inc. Wire Rope Sling Dept. Wilkes-Barre, Pa.	Wreck Master Manual Section 1A

SECTION I

DESCRIPTION

All Budd Rail Diesel Cars are of stainless steel construction with cast steel four wheel trucks. The RDC-1, RDC-2 and RDC-3 are 85 feet long, while the RDC-4 is 73 feet 10 inches long. Ready-to-run weight is approximately 120,000 pounds.

The end underframe is of a fabricated construction of NES 65 steel and incorporates a combined end sill, coupler carrier support, collision post stubs, and an integral type body center plate. Center sill, cross bearers and floor pans are of stainless steel.

The side frames are of modified girder construction with roof and floor assemblies serving as chord members, all stainless steel.

One car body jacking pad is provided at each end of each car body bolster (4 per car).

The roof is essentially comprised of corrugated stainless steel sheathing reinforced by 'Z' shaped stainless steel carlines.

An enclosure for the engine cooling radiators and fans is superimposed on the normal roof near the center of the car. End roofs are formed of stainless steel sheathing and the car end sheets are heavy gauge stainless steel.

The trucks are equipped with Model CF Budd Disc Brakes. The brakes are operated by modified H.S.C. braking system with an M-38C brake valve, D-22-BR control valve and a 'B' relay valve.

Wheel slide is prevented by the Budd Rolokron system.

The #1 or 'B' end is the location for the #1 engine.

The #2 or 'A' end is the location for the #2 engine.

See Figures 1, 2, 3 and 4 for plan views, elevations and overall dimensions for RDC's 1, 2, 3 and 4.

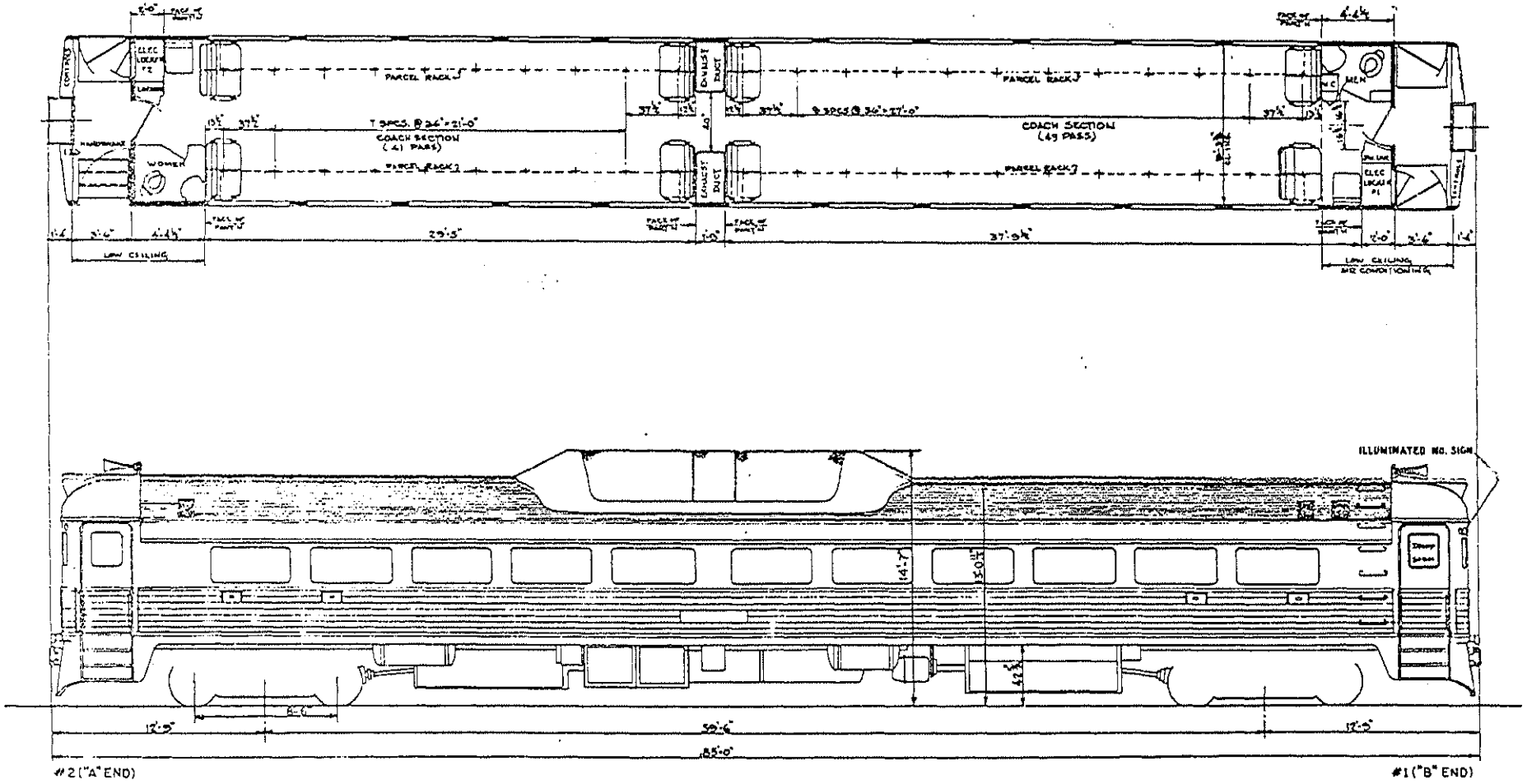
The RDC meets AAR strength requirements for unlimited service and may be placed anywhere in a train.

SECTION 1

SUPPLEMENT 1

The Reading Company RDC-1's are provided with type 26-R Brake Equipment with 26-B-1 Brake Valve, 26-C Control Valve and H-5 Relayair Valve.

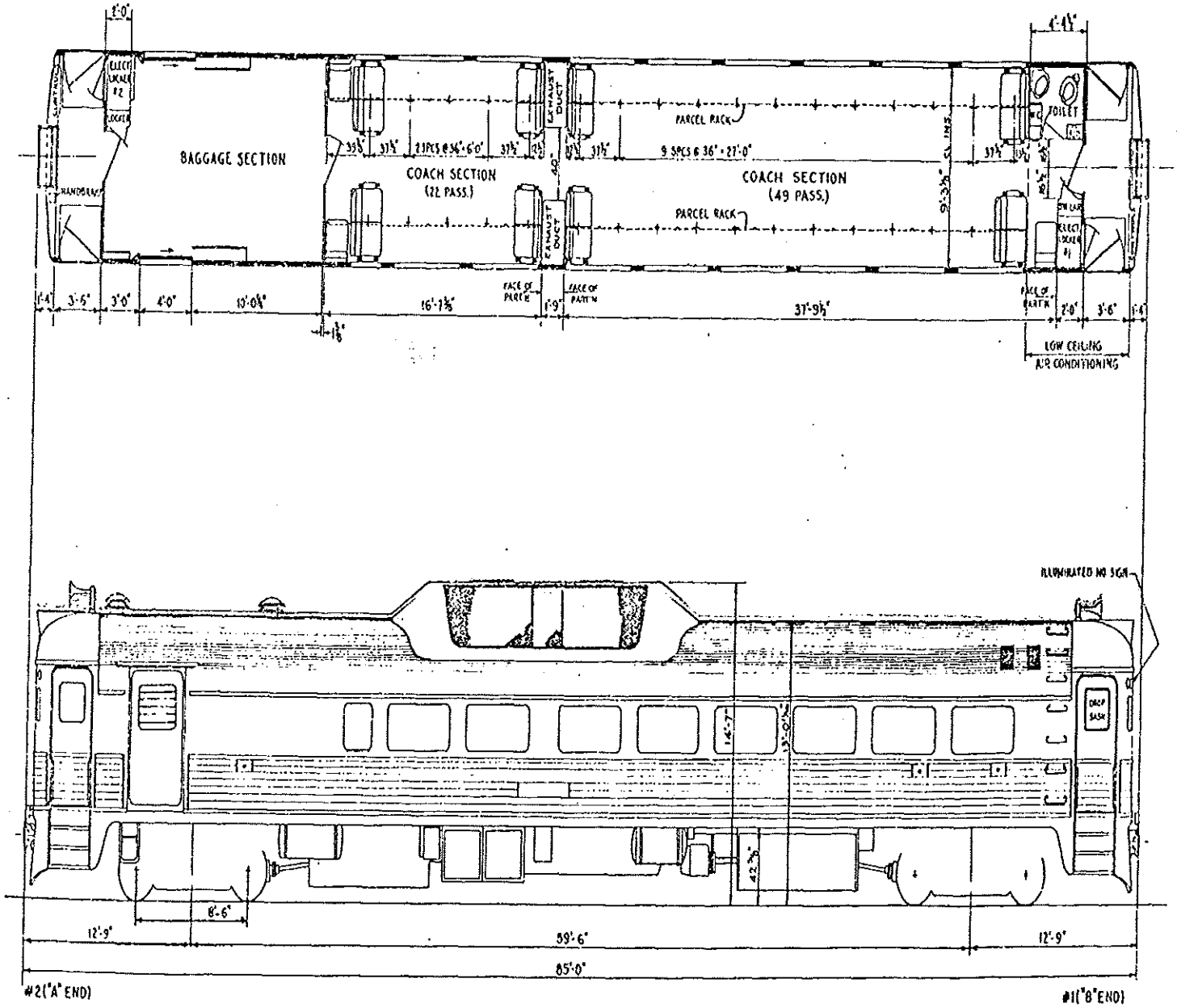
For detailed description of brake system, parts and maintenance refer to New York Air Brake Company Bulletins



R.D.C.—1 COACH

SEC. 1

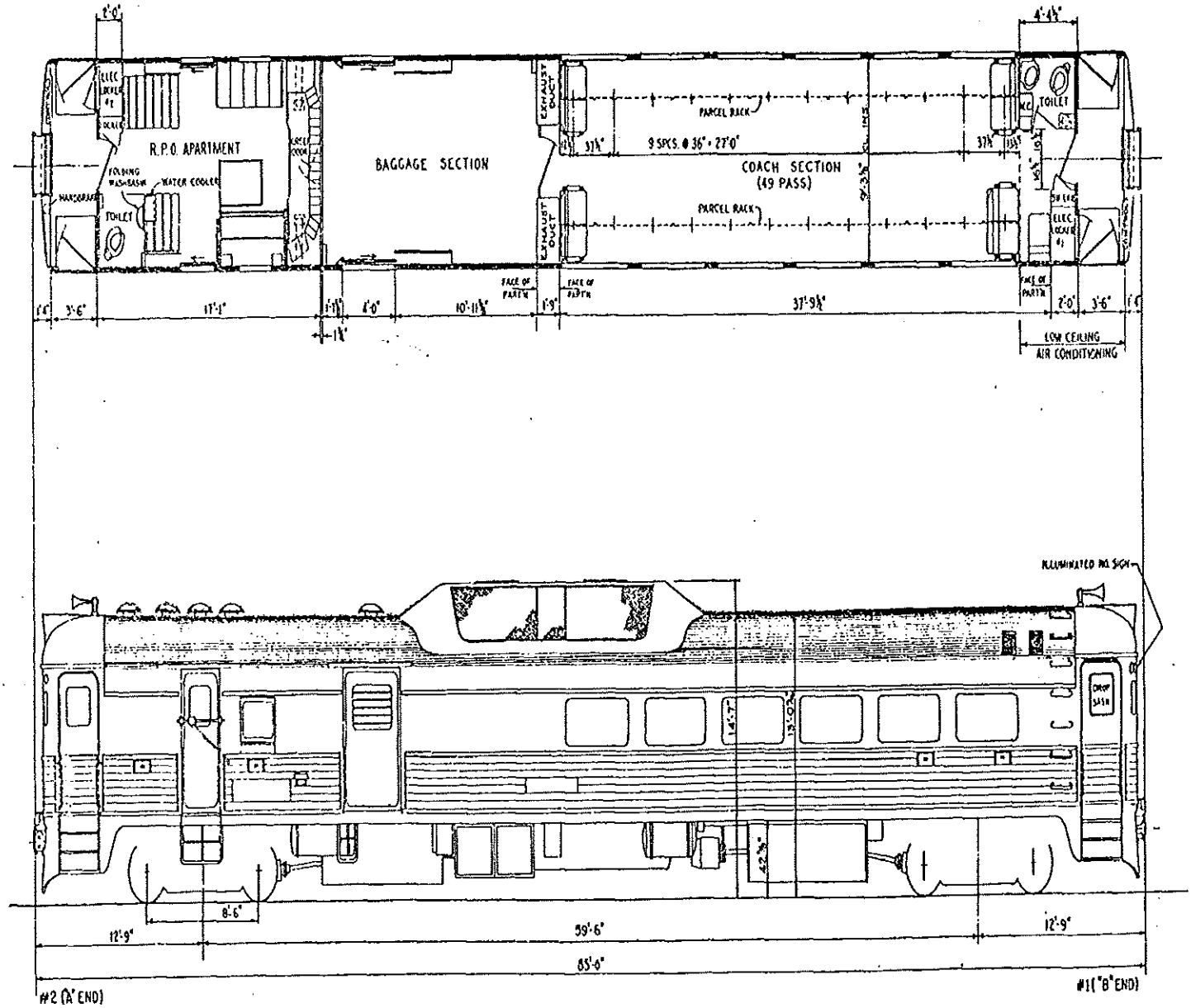
FIG. 1



R.D.C.-2 BAGGAGE COACH

FIG. 2

SEC. I



R.D.C.-3 R.P.O. BAGGAGE COACH

FIG. 3

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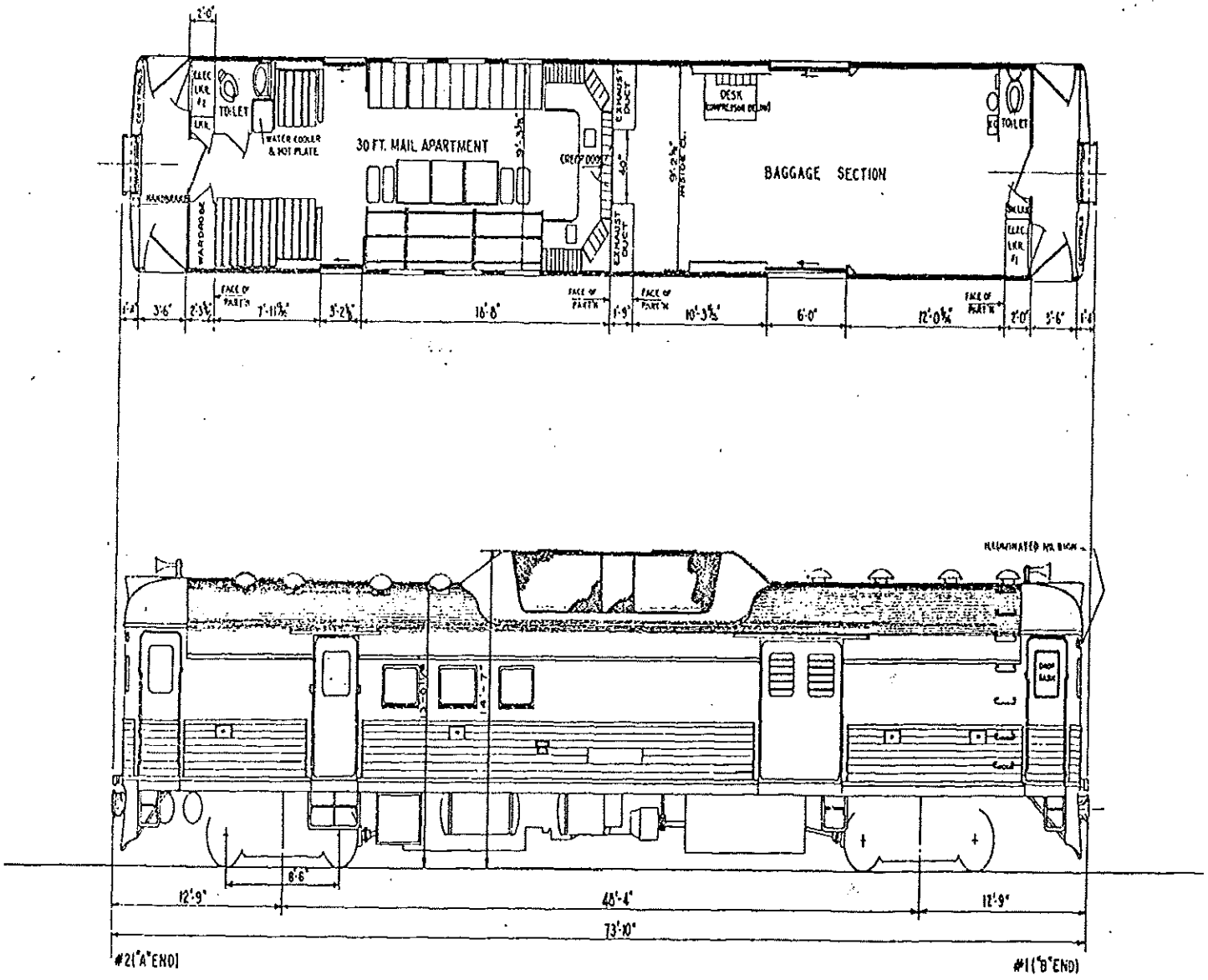


R.D.C.–4 R.P.O. BAGGAGE

FIG.4

SEC.I

SECTION 2

POWER UNIT

Each RDC is propelled by two, 2 cycle, General Motors type 6-110 Diesel Engines, developing 257 HP each at 1800 r.p.m. The power from the engines is transmitted through a torque converter, a reversing gear box, a propeller shaft and an axle mounted gear box to the wheels. The torque converter and reversing gear box are mounted on, and made a part of, the power unit. This unit is enclosed by a metal casing just inboard of each truck. The engine is inclined at an angle of 20° from horizontal and is suspended fore and aft by rubber pads as shown in Figures 1, 2 and 3.

1. FRONT ENGINE MOUNT

As shown in Figure 1, the front engine mount consists of a Torque Tube (G) and Stirrup (A), with a vibratiom absorbing rubber pad (D).

The torque tube (G) is permanently attached to the center sill and side sill of the car. The stirrup (A) is removable, being suspended from a pair of arms in the torque tube and held in place by a Pin (B), and prevented from rotating by a Stop Pin (C). A recess is provided in the lower surface of this stirrup to receive a rubber pad (D).

Under no load the rubber pad has a free height of 2 inches. However, under the load of the engine this is compressed to 1-7/8 inches. If, on inspection, the distance 'Y' (shown in Fig. 1), is found to be less than 2-1/8 inches, the rubber pad should be replaced.

a. Replacement of Front Engine Rubber Pad

First, jack up the front of the engine. This can be done by means of the 'Engine Dolly' (Fig. 4) or by a separate jack located under the front engine jacking pad. Raise the engine until the load is taken off the front rubber pad (D) in Figs. 1 and 2). Remove safety hook (F) and pull out stirrup pin (B). This will allow the stirrup (A) to drop. Insert a new rubber pad and reverse the above procedure. Be sure the safety hook (F) is properly placed.

2. REAR ENGINE MOUNT

As shown in Figure 3, the rear of the engine is provided with two wings or brackets (A): one on each side of the torque converter. A hole in these brackets matches with, and is bolted to, a load bar. These bolts are held in place by retaiming lugs secured with a cotter key. The load bar is housed in an inverted channel (C),

which is attached to the center sill and both side sills of the car body. Two rubber pads (D) are fitted into recesses cut into each end of the load bar (B). The rubber pads slide into a set of retainers welded to the inside of the channel (C) and are held in place by a stop and safety plate (F).

a. To Replace the Rear Engine Mount Pads

It is not necessary to remove the engine from the car to replace a defective rear engine rubber pad; however, it is recommended that the main drive shaft be disconnected at the engine flange in order to avoid inadvertent damage to this shaft.

The rear of the engine should be jacked up by means of two jacks; one under each rear jacking pad. After the engine is raised high enough to take the load off the rubber pads (D), remove the 6 bolts holding the safety plate (F) on both sides of the engine. Lower the engine on the jacks and the rubber pads will slide down with the load bar (B). (It may be necessary to insert a pinch bar inside the channel (C) to start the pads if they stick). The rubber pad needing replacement should be lowered faster than the opposite side so that the opposite side will not drop out. Do not lower farther than necessary to remove the defective pad.

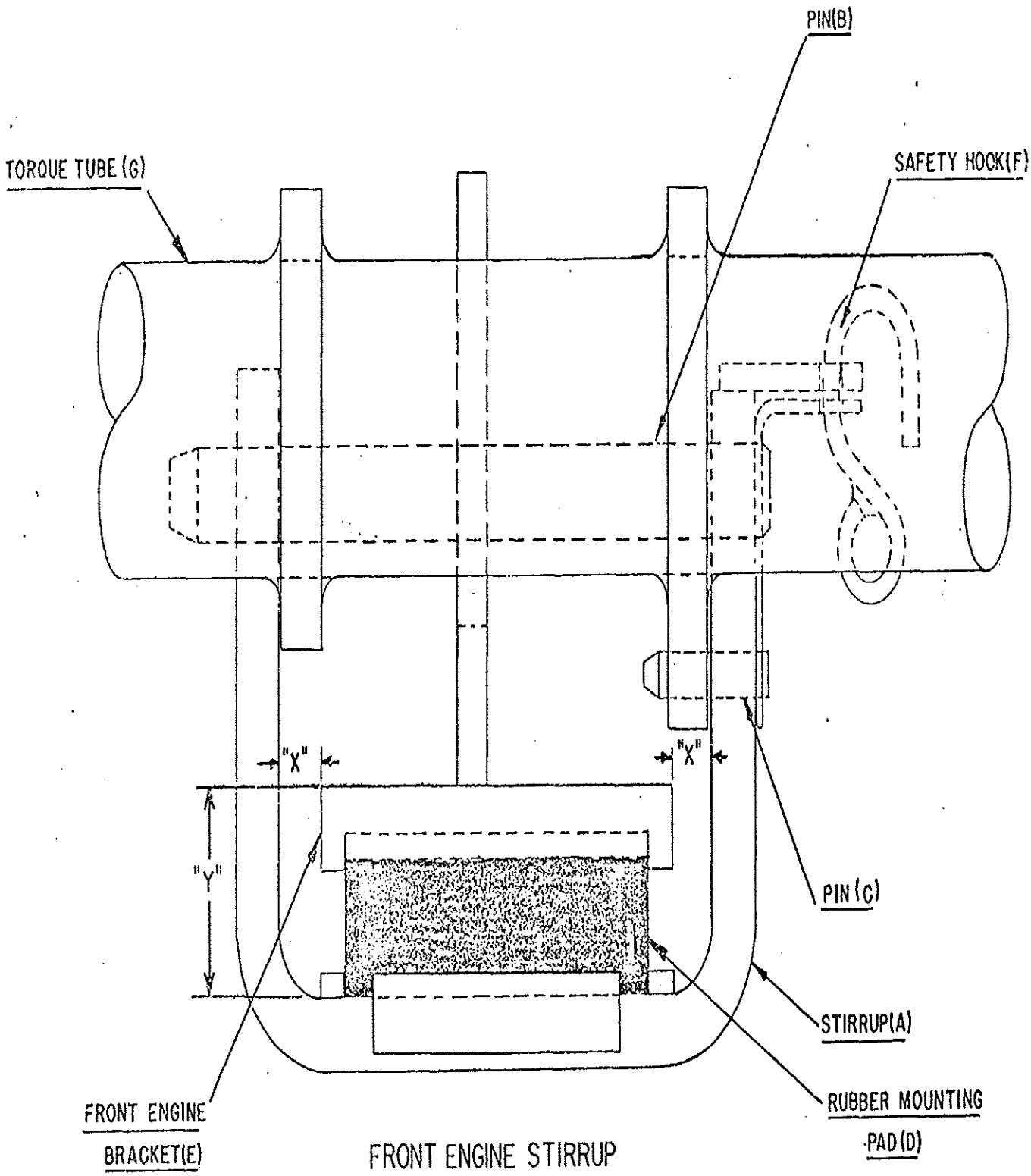
When inserting the new pad, be sure it fits properly into the recess in the load bar and that the edge of the metal plate marked "Top - Load Bar Contact Edge" is inserted correctly into the load bar recess. Jack up the engine and the pads should slide up into place in the retainer in the inverted channel. The use of a large C-clamp to squeeze the pad together will assist pad in entering the channel. After the engine has been jacked high enough, the safety plate (F) should be re-applied on both sides and the jacks removed.

b. Alignment of Engine

Whenever the power unit is installed in the car, or the rubber pads replaced, the alignment of the front engine bracket in the stirrup should be checked carefully (Dimensions 'X' in Fig. 1). If this dimension is less than 1/2 inch on either side, shims should be installed between the rear engine bracket (A) and the load bar (B) Figure 3, Section A-A, to properly center the front engine bracket in the stirrup. These shims should consist of a 3" x 3" square piece of 1/8 inch or 1/16 inch steel stock with a one inch diameter hole. The insertion of a 1/8 inch shim at the outboard side will move the front engine bracket approximately 1/4 inch toward the outboard side.

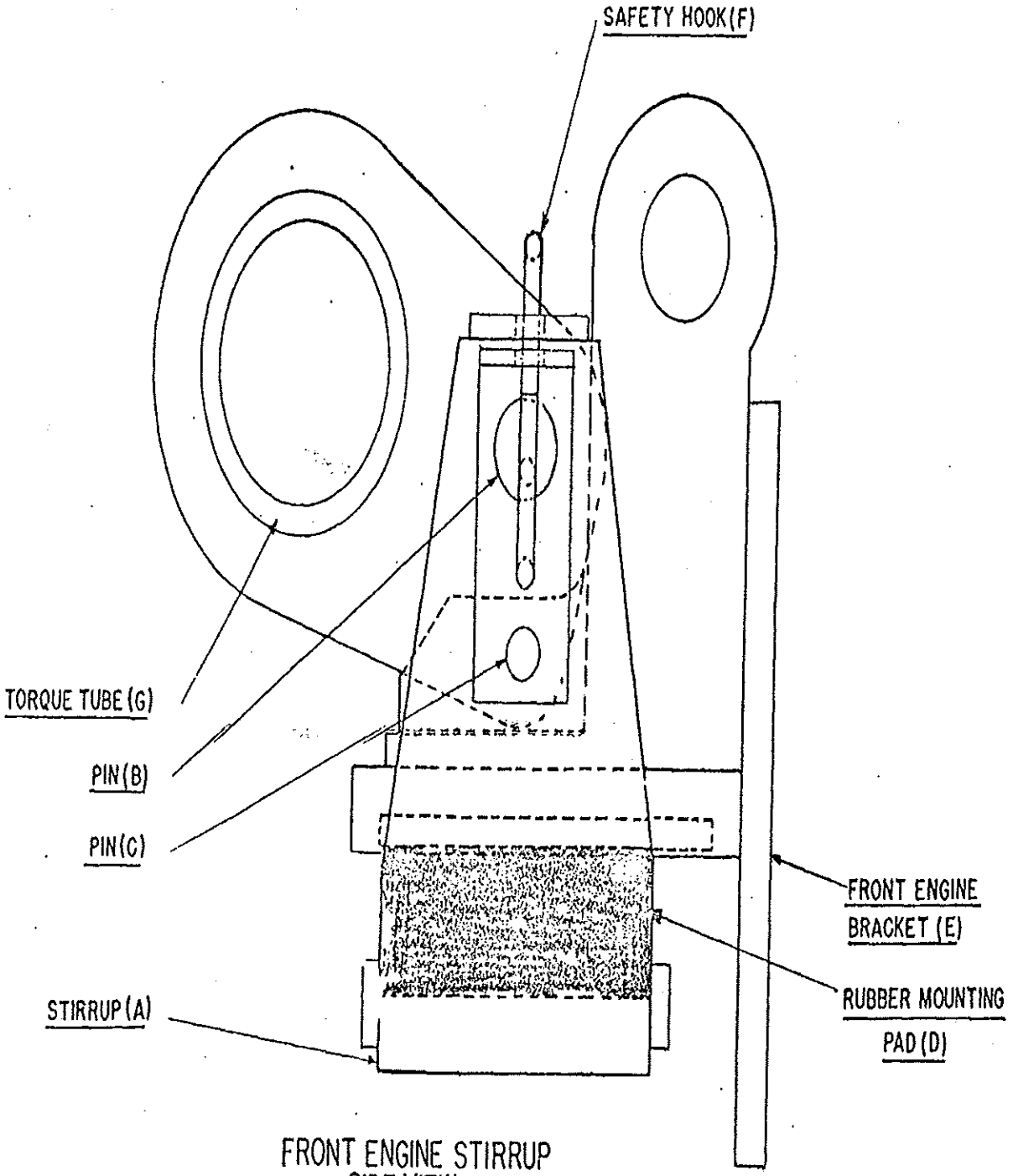
3. REMOVAL OF ENGINE

The power unit of the Rail Diesel Car can be removed and replaced in a very short time; however, in order to expedite the work, the proper tools and equipment must be on hand before starting the operation.



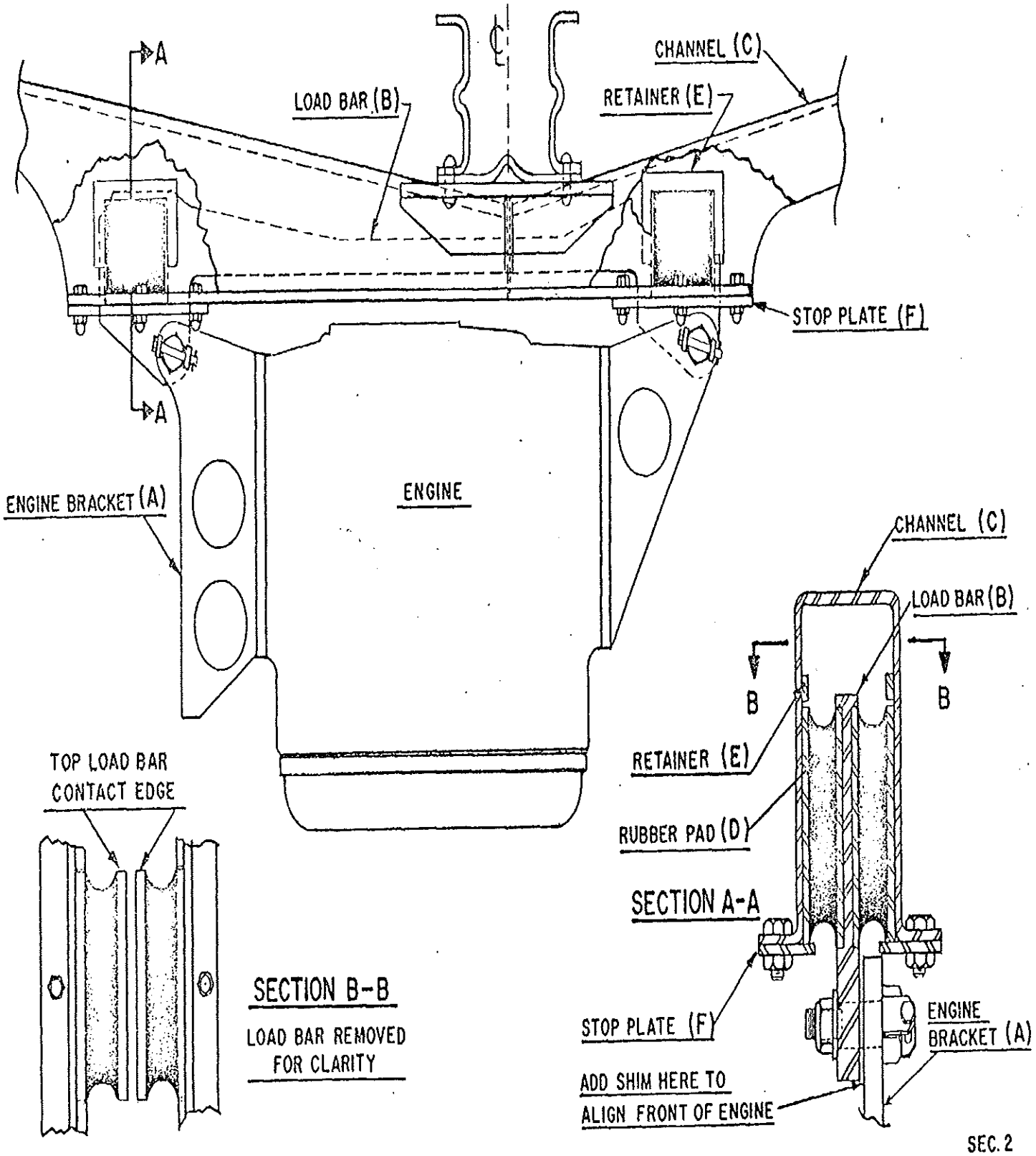
FRONT ENGINE STIRRUP
END VIEW
FIG. 1

SEC 2



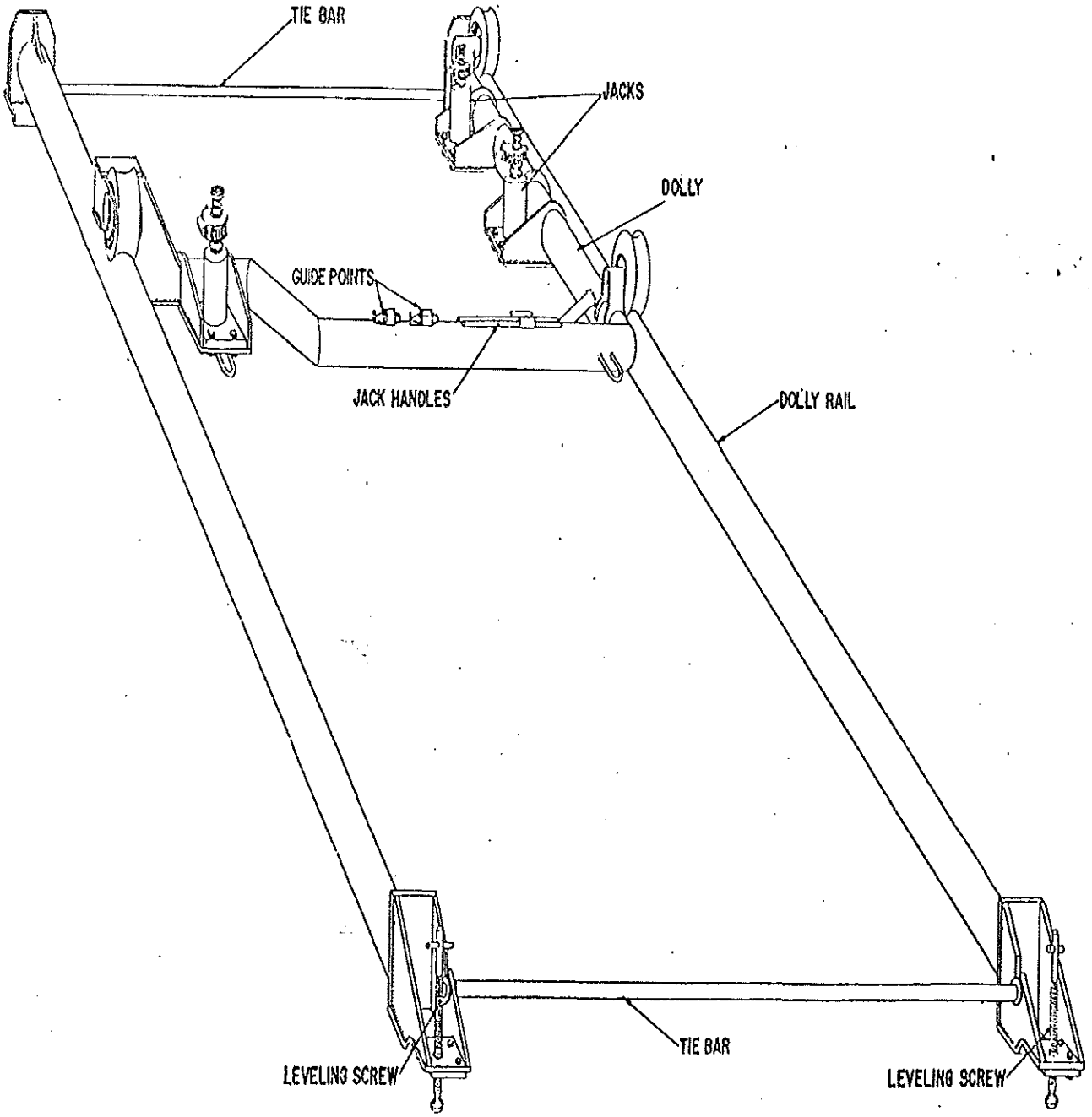
FRONT ENGINE STIRRUP
SIDE VIEW
FIG.2

SEC. 2



SEC. 2

REAR ENGINE SUPPORT — FIG. 3



ENGINE DOLLY & RAIL
FIG.4

a. An engine dolly (Fig. 4), complete with guide points, jacks, roller tracks, tie bars, jack handles, and three-wheel carriage.

b. One 18 inch or 24 inch ratchet bar with socket to fit hex nut 1-7/16 inches across the flats.

c. One 36 inch pinch bar.

d. A three pound rubber or plastic faced maul.

Drain the water from the engine cooling system by removing the master drain plug in sump tank bottom fitting. Use care not to lose the gasket on this drain plug.

NOTE: When #1 engine is drained, remove overhead heat pump Fusetron to prevent operation when dry.

When #2 engine is drained, remove floor heat pump Fusetron to prevent operation when dry.

Disconnect the following on the engine (See Fig. 5):

a. Fuel supply line (A).

b. Fuel return line (B). These lines are located on the left hand side of the engine casing and are provided with a wing nut type of quick disconnect. Tap the lug of the disconnect with a hammer to start it and then turn by hand. There is an automatic check valve in both ends of the fitting so it is not necessary to close any valves to prevent the loss of fuel oil.

c. Water-in line (C). Loosen the fire hose coupling located on the left side of the engine casing. Coupling can be turned by hand after being loosened with a hammer. Use care not to lose the gasket on this coupling.

d. Water-out line (D). Loosen coupling as in Item (C) above. This coupling is on the end of the 3-1/8 inch copper pipe at the top of the engine casing.

e. Exhaust Pipe (E). Loosen the screw which retains the clamp on the ring packing retainer. Make sure sleeve is clean. Remove the four bolts attaching sleeve flange to engine exhaust manifold flange and push sleeve into exhaust pipe so that the flanges clear when the engine is moved out.

f. Air Intake Pipe (F). Loosen the "Marman" clamp.

g. Battery Cables (G). Break quick disconnect mounted on engine support.

h. Transmission Electrical Plug (H). To remove plug, rotate the outer shell 1/8th turn counterclockwise and pull out.

i. Throttle Electrical Plug (J). This plug is removed the same as in item (h) above.

j. Breather Hose. This hose is a 2 inch OD hose inserted through a hole in the bottom pan of the engine casing. It will pull out as the engine is rolled out.

k. Propeller or Main Drive Shaft (L). This shaft is attached to the engine driving flange by twelve 7/16 inch nuts, bolts and washers.

l. Generator Drive Shaft (M). This shaft is attached to the front engine driving flange by four 1/2 inch nuts, bolts and lockwashers.

The bearings on the rollers of the three-wheel carriage or dolly should be well greased. The three jacks should be well oiled and both top and bottom threads run in and out approximately 1-1/2 inch by hand to see that there is no binding before the carriage is positioned under the engine.

To properly locate the Engine Dolly:

a. Drop a plumb line from the rear face of the load bar (Fig 3, Section AA) of the rear engine mount and mark both rail heads.

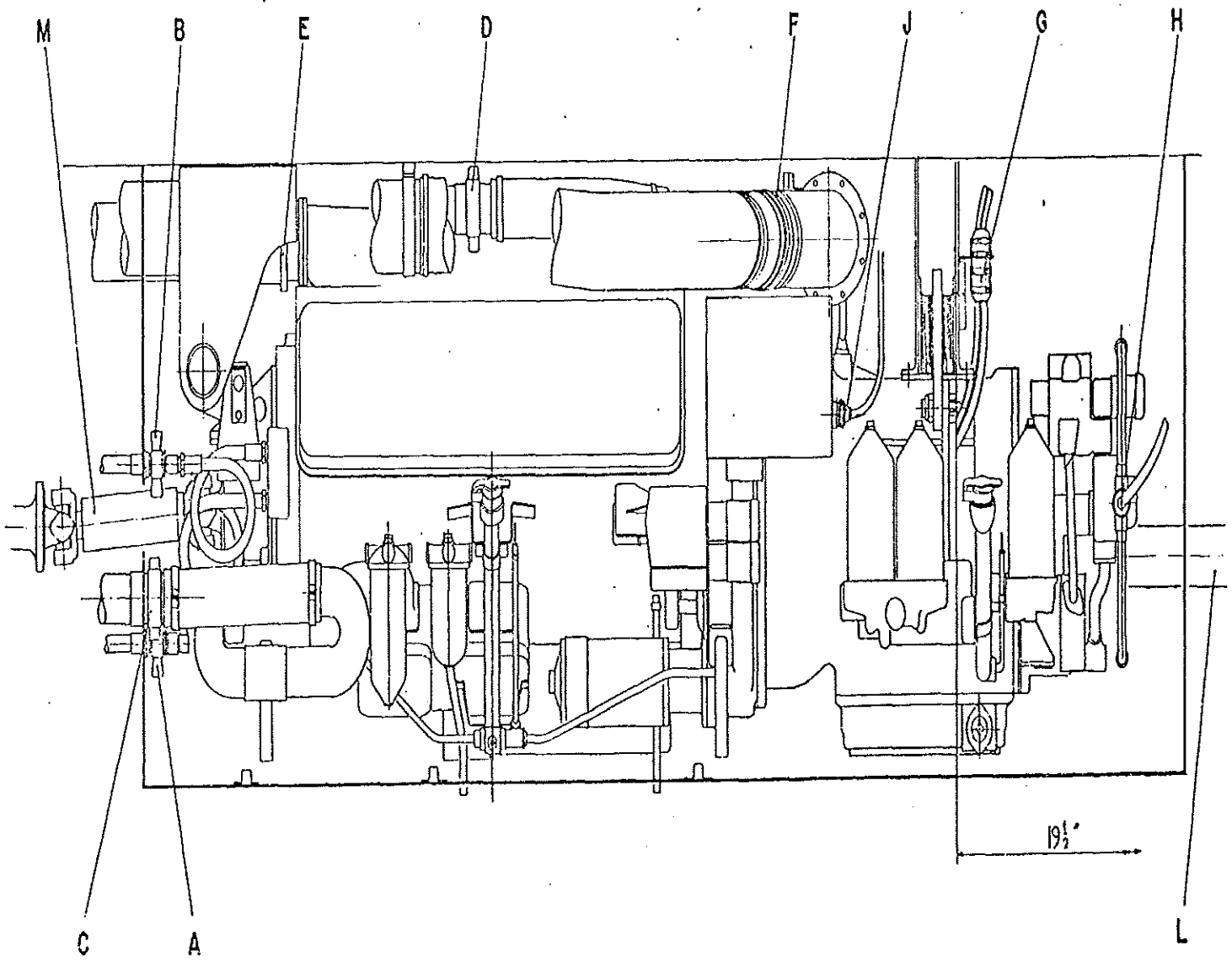
b. Slide the tubular rails of the dolly under the engine and locate the center of the right hand dolly rail 19-1/2 inches to the right of the mark on the rail head (See Fig. 5).

c. Install the tie bars on the ends of the dolly rails and level up the rails by means of the leveling screws. (Be sure there are no high spots in the floor on which the carriage will catch when rolled out).

d. Slide the carriage under the engine, making sure the jack heads index with the recesses in the engine jacking pads. (The carriage can be slid fore and aft approximately 2 inches on the roller shafts, thus making it unnecessary to move the tubular rails of the dolly).

e. Remove cotter pin and safety bolt, then loosen the nuts on the rear engine support bolts until they can be turned by hand.

f. Raise all jacks together (see that both upper and lower screw threads of each jack are ejected equally) until the load on the rubber pads of both fore and aft mounts is just beginning to be taken by the jacks.



A. FUEL SUPPLY
B. FUEL RETURN
C. WATER IN
D. WATER OUT
E. EXHAUST PIPE
F. AIR INTAKE
G. BATTERY CABLES
H. TRANSMISSION PLUG
J. THROTTLE PLUG
L. MAIN DRIVE SHAFT
M. GENERATOR DRIVE SHAFT

LOCATION OF ITEMS TO BE DISCONNECTED FOR ENGINE REMOVAL

FIGURE 5
SECTION 2

g. Continue raising the rear jacks until they are extended far enough to take the load from the rear support bolts. Drive the bolts out of the support, using the guide points provided in the clips on the dolly carriage. The guide points will protect the bolt threads. Lower the rear jacks approximately half way.

h. Raise the front jack far enough to take the load from the stirrup. Remove the safety hook and pull out the stirrup pin (B) Figs. 1 and 2. The stirrup and front engine mounting pad will drop.

i. Lower all three jacks together until they bottom. While the engine is being lowered, check the exhaust pipe connection to see that it is clear and does not bind and hang up as the engine is being lowered.

j. Roll the engine out on the carriage to a point where it can be picked up with a crane.

The power unit should always be lifted by means of a three point chain: One chain on the front lifting lug and one chain on each of the "eye" bolts screwed into the top surface of the torque converter. NEVER use the holes in the engine wing brackets for lifting. Three eye bolts will be found wired together with one "eye" bolt screwed into tapped hole at top of transmission.

4. INSTALLING A NEW ENGINE

The power plant is shipped from the manufacturer less certain accessories such as hoses, etc.,which should be installed on the engine before it is rolled under the car. These items are as follows:

a. Water outlet hose with quick disconnect couplings.

b. Water inlet hose with quick disconnect coupling.

c. Inlet and outlet fuel hoses with quick disconnect coupling.

d. Air inlet flexible hose, tube assembly and Marman flange.

e. One 1-1/4 inch square head pipe plug (transmission sump drains).

f. Breather hose and clamp.

g. Starter cables with male plug assembly.

h. Weston Tachometer Generator.

i. Two 1/4 inch air box drain hoses and hose clamps.

Piece numbers for above parts will be furnished upon request.

It is recommended that the above parts be installed while the engine is on the dolly and before it has been rolled under the car. This will save considerable time since some of these parts are inaccessible after the engine has been installed.

After the above accessories have been installed:

a. Locate the engine dolly under the car as instructed under REMOVAL OF ENGINE. See that all jacks are 1/4 thread above bottomed position (to prevent binding when the engine is lowered). Then lower the engine on the dolly.

b. See that the stirrup pin (B), Fig. 1, of the front engine mount is pulled and the stirrup removed.

c. Roll the engine under the car. Feed the breather hose into the hole in the engine casing as engine is rolled under.

d. Install the front rubber pad in the stirrup.

e. Raise all jacks together until the engine is raised to within 3 inches of its final position, then raise the front jack only until the stirrup can be moved into position and the stirrup pin driven home.

f. Lower the front jack until the rubber pad starts to compress.

g. Raise the two rear jacks together until the rear mounting bolts can be inserted. Slide the sleeve from the exhaust pipe and align flange to engine exhaust manifold flange. Insert bolts and tighten securely. Tighten screw which retains the clamp on the ring packing retainer.

h. Insert rear mounting bolts, using guide point, tighten the elastic stop nuts, and apply safety bolt with cotter key.

i. Check clearance on front engine mount (Dimensions 'X' Fig. 1) and add shims to the rear mount if necessary, as explained under ALIGNMENT OF ENGINE.

j. Lower all jacks and remove Engine Dolly.

k. Connect the following:

(1) Water-out hose

(2) Water-in hose

(3) Fuel supply line

(4) Fuel return line

(5) Air intake hose

(6) Exhaust pipe

(7) Transmission electrical plug

(8) Throttle electrical plug

(9) Battery Cables

(10) Main drive shaft

(11) Generator drive shaft

(12) Tachometer generator electrical plug.

1. Check that the safety hook is in place on the front engine mount, and nuts on the rear mounting bolts are tight and secured with bolt through retainer lugs, with cotter key properly applied.

The engine cooling system should be filled with water and air bled from the top of the fuel filters. Check the lube and transmission oil levels and the engine is ready to be started.

SECTION 3

TRUCK ASSEMBLY

DESCRIPTION - Refer to Fig. 1.

The RDC cast steel trucks are four wheel, single equalizer, single bolster, swing hanger, equipped with coil equalizer and coil bolster springs; longitudinal bolster anchor rods and transverse spring plank stabilizing rods.

The bolster includes an integral center plate, spring pockets and anchor brackets; rubber cushioned friction type side bearings and provisions for self-locking center pin. Spring plank safety straps are bolted to the truck frame transom.

The "I" beam shaped equalizer beams, swing hangers and swing hanger cross bars are forged alloy steel. The swing hangers are fitted with bushings for swing hanger pins.

Two shock absorbers are provided on each truck to dampen the vertical motion of the bolster.

The wheels are 34" diameter, type A-34 high carbon rolled steel, to AAR Specification M-107-53, Class CR. They have a 2-1/2" rim with AAR G-4-1951 tapered tread and are machined to a concentricity about the journal centers of .010", and dynamic unbalance of 1.5 pounds maximum. Wheel unbalance location is stamped on the inside of the rim at the heaviest point.

The axles are AAR Standard. They are machined all over and ground at the journal sections for roller bearings. A splined bushing is provided at both ends of each axle for use with the Budd Rolokron, anti-wheel slide equipment.

One axle per truck is machined with an involute spline in the center portion for engagement with the axle drive unit. The non-driven axle has a tapered center section.

Mounting of wheels should be with heavy sides approximately 180° apart. Wheel mounting pressure should be 80 tons minimum to 120 tons maximum. Circumference of wheels on one axle must not vary more than 1/2 tape (1/16").

The journal bearings are double row spherical roller type, with boxes to fit pedestal opening of 13-3/8" x 8". The journal boxes are equipped with manganese steel wear plates. The rear enclosure is made to support the Budd Disc Brake equipment and sanding nozzles. Two boxes per truck are provided with front adapter for mounting the Budd Rolokron axle unit. One stench and one smoke bomb

are provided with each journal box. The stench bomb is located on the left side and the smoke bomb on the right side.

Each axle is equipped with Budd disc brake equipment. Both disc brake assemblies of the #2 (A) end truck are provided with a handbrake arrangement.

Refer to Disc Brake Service Manual for general description and maintenance.

1. TRUCK BOLSTER

The bolster center plate is protected from wear by a stainless steel wear liner welded to the outside diameter. At the time of overhaul, this liner should be inspected for excessive wear and cracks.

If replacement of this liner is necessary, refer to Figure 1 of this section for location and welding information.

Two bumper blocks are provided, one at each end of the truck bolster, to cushion the lateral motion of the bolster. The bumper blocks consist of a rubber pad vulcanized to a steel backing plate. One bolt hole is provided in each block for attachment to the bolster. The steel backing plate is tack arc welded to the bolster.

Replacement of these blocks is necessary when the rubber pad becomes excessively worn, torn, distorted or is found to be tearing from the steel backing plate.

To remove the bumper blocks, remove the nut and bolt, chip weld and lift block vertically from the truck.

2. SIDE BEARINGS (TRUCK)

Each side bearing consists of a base, rubber sound deadening pads and a cap. The top of the base is divided into four sections by a cross shaped web. Each section contains one rubber sound deadening pad cemented in place. The cap covers the rubber pads and provides a wear surface.

a. Adjusting side bearings

Side Bearings must be adjusted so that both on same truck touch lightly. There should be approximately 1/64" to 1/32" pre-compression in the rubber. Add or remove shims under side bearing base as required. The amount of shimming should be approximately equal on both ends and on the same side of the car. Shims are available in 1/16, 1/8, 1/4 and 1/2 inch thicknesses. Side bearing

shimming should not be used as a means of leveling the car. The condition of the rubber sound deadening pads should be determined before making adjustments. If, on inspection, the pads are found to be deteriorated, or to have become set so as to permit metal to metal contact between the cross shaped web and the underside of the side bearing cap, the pads should be replaced. Also, it is important that the car be level and on level track before making adjustments to the side bearings.

b. Removing and installing shims

Loosen the side bearing retaining nuts sufficiently to permit free movement of the shims. Each shim is provided with one long and one short slot. Slide the shim to be removed in the direction of the end with the longer slot. This will allow the shim to be rotated clear of the opposite bolt. The shim can now be removed. To add shims, reverse the above procedure. It is important that the side bearing retaining nuts be tightened securely to prevent creeping of the side bearing and shims.

c. Replacing side bearing sound deadening pads

Raise car body sufficiently to permit removal of the side bearing cap. Remove the four rubber pads and insert replacements, using a light coat of adhesive on side bearing cap, base, and both sides of rubber pads. When adhesive is tacky, assemble and press down by hand. Replace the cap and lower the car body.

3. BOLSTER SPRINGS

The bolster springs consist of two nests of coil springs - one at each end of the truck bolster. Each nest is made up of three coil springs - one inner coil, one middle coil, and one outer coil. The middle and inner coil are coated with sound deadening material to prevent rattling.

The RDC-1 bolster springs for the #2 (A) and the #1 (B) end trucks are alike in that the free heights are the same.

The RDC-2, 3, and 4 bolster springs for the #2 (A) and the #1 (B) end trucks differ in free height due to the weight distribution of these cars.

For correct locations and spring part numbers, refer to the "Rail Diesel Car Parts Catalog".

4. EQUALIZER SPRINGS

The equalizer springs consist of four nests of coil springs - two nests located between the equalizer beam and the frame at each side of the truck. Each nest is made up of two coil springs - one inner coil and one outer coil. The inner coil is coated with sound deadening material to prevent rattling.

The RDC-1 equalizer springs for the #2 (A) and the #1 (B) end trucks are alike in that the free heights are the same.

The RDC-2, 3, and 4 equalizer springs for the #2 (A) and the #1 (B) end trucks differ in free height due to the weight distribution of these type cars.

For correct locations and spring part numbers, refer to the "Rail Diesel Car Parts Catalog".

NOTE:- Spring heights vary in accordance with tolerances. This must be taken into consideration while assembling the truck. For a car well balanced laterally, the springs must be grouped so that all the high or low springs are not located on one side. For a car which is known to be off-balance laterally, it is advantageous to place the high springs on the heavy side of the car.

5. SWING HANGER ASSEMBLY

The four swing hanger assemblies are fitted with bushings for swing hanger pins. If bushings become worn, out-of-round, or loose in the swing hanger, they must be replaced.

Bushings are press fitted into the swing hanger with a minimum of four tons pressure.

Swing hanger pins should be replaced if they are found to be badly worn or out-of-round.

Excessive wear at the cross bar seat of the swing hanger is reason for replacement.

6. SHIMMING

With wheels of 34" diameter, approximately 1-1/2" of shimming space is available to compensate for wheel wear. Correction is normally accomplished at the equalizer springs.

The truck has available 5-3/4" shim space which includes sound deadening pads, distributed as follows:

Center Plate - 1".

Bolster Springs - 1-1/2"

Swing Hanger Bearings - 3/4" including sound deadening pad.

Equalizer Springs - 2-1/2" maximum, divided 1-1/4" at the top and 1-1/4" at the bottom.

A 1/2" shim is provided at the bolster springs which may be removed to lower the car.

The 3" nominal to the 2" minimum dimension between the bolster and frame must be maintained. Any variation in this dimension can be corrected at the bolster springs and swing hanger bearings by adding or removing shims.

To correct for Lean

Normally balanced cars should not lean more than 1/2" in 10 ft. to either side of normal. It must be kept in mind that while the car is normally designed to be level with full service load, there are cases where the live load may be off-center.

a. Shims may be added to the low side under bolster springs and swing hanger bearing, or removed under the high side. The amount of shimming should be approximately equal at both ends and on the same side of the car.

b. The correct space between the bolster and truck frame may be obtained by adding or subtracting shims at the bolster springs. Some correction of lean is possible by adding a 1/4" shim in the pocket of the cross bar bearing. On the opposite side of the car, the 1/4" shim, if provided, may be removed. Only if further correction is required should shims be added under the equalizer springs.

NOTE: No alteration of shims under the side bearings will be allowed for leveling purposes.

7. INSTALLING AND ADJUSTING SPRING PLANK ANCHOR

The spring plank anchor is the stabilizing tie between the spring plank and bolster. It consists of a spacer tube with flat washers welded on each end and a tie rod threaded on each end, which accommodates rubber pads, adjustment washers, flat washers, slotted hex nuts and cotter pins.

The following procedure must be performed on both spring plank anchors:

(a) Install spacer tube, tie rod, inboard adjusting washers and rubber pads. The inboard spacer washers are used

to maintain 22" dimension between the center line of bolster extension and spring plank extension.

(b) Install outboard rubber pads, adjusting washers, flat washers and hex slotted nuts on each end.

(c) Tighten slotted nuts to compress the rubber pads to 2¼" dimension as shown in Fig. 1. The 22" dimension must be maintained at both spring plank anchors.

(d) Apply cotter pin at each end.

8. INSTALLING AND ADJUSTING BOLSTER ANCHOR RODS (Bolster to Frame)

The bolster anchor is located between the bolster and truck frame. It consists of a spacer tube with flat washers welded on each end and a tie rod threaded on each end, which accommodates rubber pads, adjustment washers, flat washers, slotted hex nuts and cotter pins.

The following procedure must be performed on both bolster anchors:

(a) Install spacer tube, tie rod, inboard adjusting washers and rubber pads. The inboard spacer washers are used to maintain 2' 11-13/16" dimension between the center line of bolster and truck frame extensions.

(b) Install outboard rubber pads, adjusting washers, flat washers and hex nuts on each end.

(c) Tighten slotted nuts to compress the rubber pads to a 2-7/16" dimension as shown in Fig. 1. The 2' 11-13/16" dimension must be maintained at both bolster anchors and the bolster must be centered with the truck frame.

(d) Apply cotter pin at each end.

9. SHOCK ABSORBERS

Inspection and Maintenance

It is recommended that the units be inspected at intervals of approximately 60,000 miles to make sure that they are operating properly. This need be only a minor inspection and should be made to determine whether or not they are still in good operating condition.

Inspections

This inspection should be made as follows:

a. Check for Control

Remove the upper mounting nut, cotter pin, upper rubber mounting block and mounting cap. Compress the unit an inch or two and pull upward on the outer tube. Repeat two or three times. The unit should extend with considerable resistance and

push together more easily than it extends. If the unit should extend easily, loss of control is indicated and it should be removed from the truck for more accurate test.

b. Check for Leakage

A light film of oil or small amount of fluid on the lower tube does not signify serious trouble with the unit. A considerable quantity of fluid on the lower tube indicates serious leakage and the unit should be removed and replaced.

c. Check for Binds

Turn the outer tube completely around. It should turn without appreciable resistance. If a point is found beyond which the unit can be turned, or where extreme resistance to turn is encountered, a major bind is indicated and the unit should be replaced. A minor bind where some resistance to turning is found, but the unit can be turned through this point without too much difficulty, may be regarded as not serious.

d. Check Condition of Mounting Rubbers

Make sure that the rubber mounting blocks on both ends of the unit are in good condition. If they have become badly worn or have deteriorated appreciably, they should be replaced with new parts.

IMPORTANT - The amount of compression on the rubbers is determined by the shoulder on the stem at each end of the shock absorber. Make sure that the mounting nuts are tightened securely against the shoulder before installing the cotter pin

Shock absorber repairing is a costly and general unsatisfactory procedure, as the expense involved in producing a good repair is usually as much or more than the cost of a new unit, and of course any repaired unit is still not as satisfactory from a life standpoint as a new one.

Defective shock absorbers should be returned to the factory for repair or service. This is considered to be the most satisfactory method of repair. Nevertheless, experience has proven that in general it is more economical to discard a defective unit and replace it with a new one. It is then only necessary for the storekeeper to maintain a small stock of replacement units and rubber mounting blocks, instead of a large number of repair parts, replacement units, mounting rubbers, service tools and service equipment.

Refilling

These shock absorbers are sealed at the factory and cannot be dismantled or refilled. The seals are of an improved design built to last the life of the unit, and since the fluid will not break down or deteriorate with use, it is therefore unnecessary to refill these units. Should a unit ever develop a serious leakage, it should be replaced.

10. JOURNAL BEARINGS

Grease lubricated SKF 5-1/2" x 10" Spherical Journal Bearings are used on the RDC Wheel Assemblies.

It is recommended that standard AAR and Railroad practice be followed for inspection and maintenance of SKF Spherical Journal Bearings.

For further information refer to SKF Maintenance Instruction Manual for Z-4506-B-2 Bearings.

11. SOUND DEADENING

Rubber pads are placed under the side bearing caps, at the ends of the bolster anchor and transverse spring plank stabilizing rods and at the axle gear unit torque arm supports. Rubberized fabric pads are provided at the equalizer seats on the journal boxes, at the swing hanger bearings and at the equalizer spring seats.

A composition Thermoid pad is provided between the surfaces of the body bolster and the truck bolster center plate.

12. CENTER PIN

Description

The center pin is a three piece interlocking type inserted through an opening at the underside of the truck bolster. For instructions for removing and installing, see Fig. 2.

13. SIGNAL SHUNTING EQUIPMENT

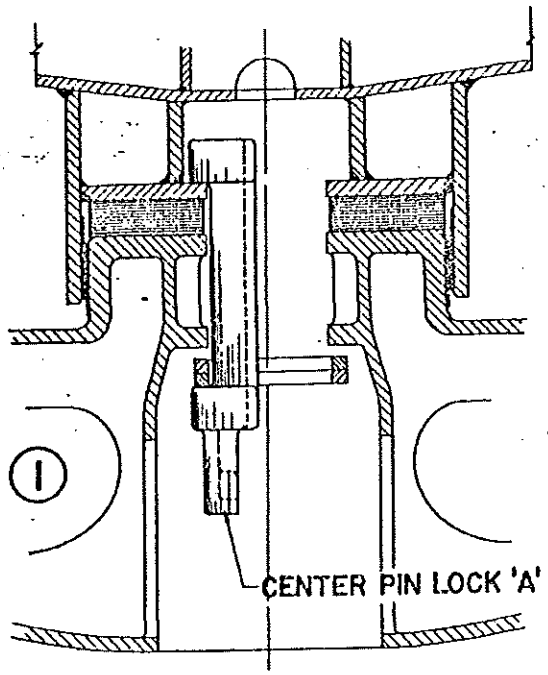
Description

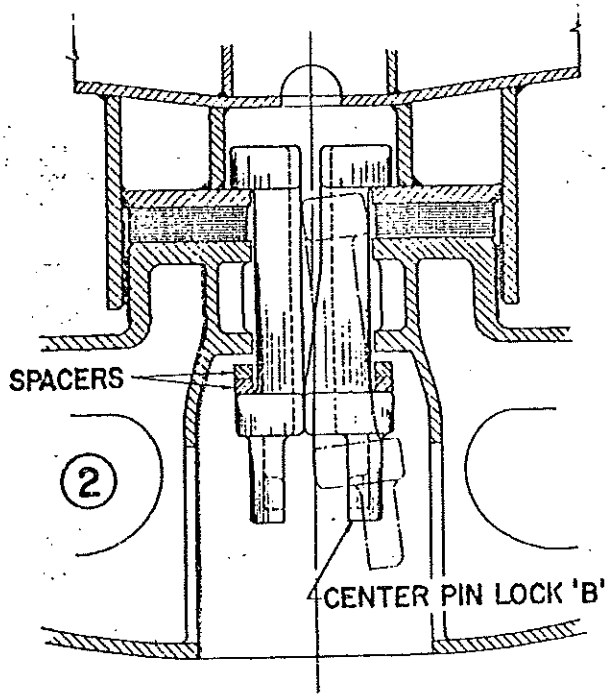
The equipment for each wheel consists of one shunt block attached to a torsion bar. The bar is supported at two points on brackets welded to the center transom of the truck frame. At each point of support a sound deadening bushing is provided. Cable assemblies are attached to the shunt block, to the torsion bar and truck frame. Also from the truck frame to the car body. This provides a continuous path for the signal circuit.

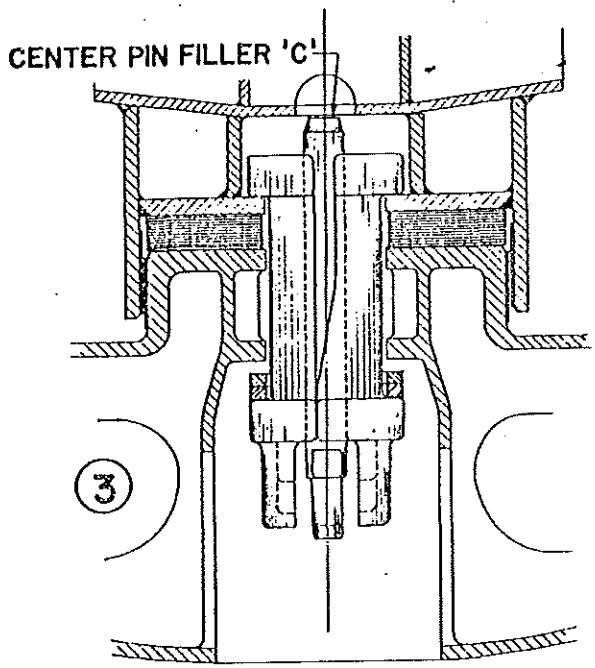
Inspection and adjustment

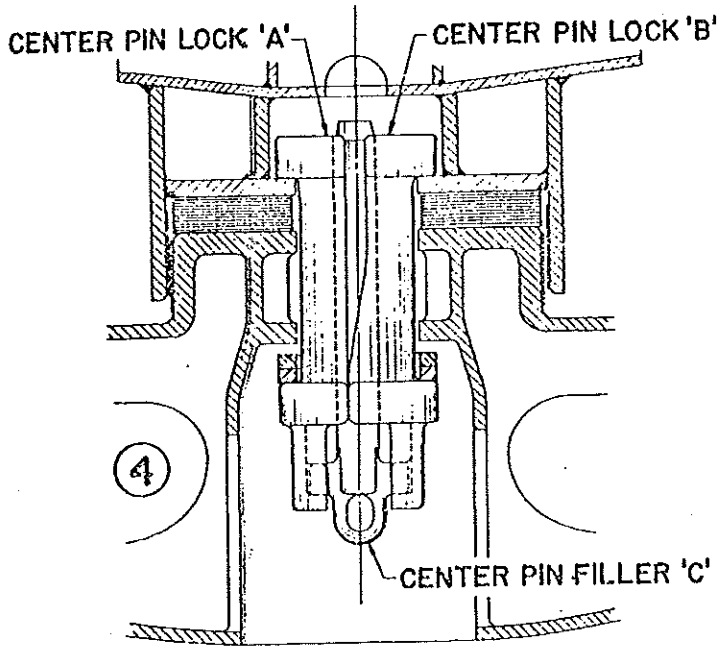
The shunt blocks should be periodically inspected for wear. Shunt block replacement should be made when vanes indicate 3/4" metal remaining and if the torsion bar bushing assembly is riding close to the wheel flange.

a. Check that the cotter key which retains the shoe to the torsion bar is secure.









DIRECTIONS FOR APPLYING CENTER PIN

1. INSERT LOCK 'A'.
2. INSERT LOCK 'B'.
3. INSERT CENTER PIN FILLER 'C' TO LOCK CASTINGS.
4. ROTATE THE CENTER PIN FILLER 'C' ONE QUARTER TURN (90°). SHOULDERS OF FILLER WILL ENTER THE OPENINGS IN THE LOCK CASTINGS. FILLER WILL THEN DROP INTO POSITION IN THE POCKETS PROVIDED IN THE LOCK CASTINGS.

TO REMOVE CENTER PIN, REVERSE PROCEDURE.

FIGURE 2.
SECTION 3.

b. Check that the torsion bar bearing clamp attaching bolts are secure and the rubber bushing is in good condition.

c. Check that the adjusting nut is properly tightened and its associated rubber bushing has approximately 1/16 inch compression.

d. Check that the cable terminal bolts are tight.

e. The shunt blocks are held against the wheel by the torsion bar with a pressure of 20 lbs. plus or minus 5 lbs.

This can be measured with a spring scale hooked to the torsion bar at the shunt block. Lift the block just clear of the wheel tread and read scale. The load must be established with the truck under the car ready to run.

Adjustment is made by adding or removing washers under the eye bolt as required. Rubber bushing is to have approximately 1/16" compression.

The torsion bar assembly is bent in a gradual sweep to give 1" offset toward the center of the car. This applies side pressure on shunt block against the radius of the wheel flange.

14. TRUCK REMOVAL

a. Cut off the air by means of the cutout cock located underfloor to the right of the Rolokron control box.

b. Disconnect at the truck connection, the flexible air hoses (car body to truck).

c. Disconnect the shunt cable assemblies (car body to truck).

d. Remove the clevis pin attaching safety chain to gear box.

e. Disconnect #1 and #2 drive shafts. This prevents possible damage to the drive shafts when lifting the car.

f. When removing the handbrake truck release the handbrake and remove the clevis pin to disconnect the handbrake chain. Remove the handbrake rod support from the end underframe.

g. Remove the self-locking center pin. (See Fig. 2 for instructions for removal).

h. Disconnect the Rolokron cable assembly.

i. Disconnect the sand delivery hoses.

j. Position car body jacks at the jacking pads. (One car body jacking pad is provided at each end of each car body bolster). Raise car body high enough to enable truck to clear car structure when truck is rolled out.

15. REMOVING WHEEL AND AXLE ASSEMBLY

A. Apply the following before removing the truck from the car:

1. Apply a hardwood block between the bolster and the truck frame on both sides of the car.

2. Chain the equalizer beam to the truck frame on both sides of the car. This prevents dropping the equalizer beam when the wheels are removed.

NOTE: Disconnect drive shafts at gear unit to prevent possible damage to shaft when lifting car.

B. Procedure for removing wheel assembly:

1. Disconnect Rolokron cable - axle unit to truck frame.

2. Disconnect axle gear unit torque arm from the truck frame when removing the drive wheel assembly.

3. Remove the pedestal tie bars from the pedestal legs.

4. Raise the truck frame sufficiently, remove the journal box saddles, pads and seats.

5. Roll the wheel assembly clear of the truck.

C. Procedure for installing the wheel assembly:

1. Apply a light coat of graphite lubricant to the rubber backed bearing wear plate of the disc brake frame and the journal box rear enclosure on both sides.

2. Position the wheel assembly under the raised truck frame.

3. Lower the truck assembly. While lowering the assembly, watch for proper engagement of the disc brake frame bearing arms. There should be no binding and the bearing arm should snap over the journal box enclosure.

4. On drive wheel assembly, guide the torque arm into position under the projection at the transom. Re-apply the torque arm rubber pads - after replacing any that are worn or deteriorated. Install the torque arm bolt and tight to obtain 1/32 inch pre-compression on each pad and insert the cotter pin.

5. Center the saddles, pads and seats for equalizer beam on the journal box.

6. Re-apply the pedestal tie bars to the pedestal legs.

7. Remove the chain supporting the equalizer beams.

8. Remove the hardwood blocks from between the bolster and the truck frame on both sides.

9. Connect the Rolokron cable - axle unit to truck frame.

NOTE: If other facilities are available for removing wheel assemblies, modify the above procedures accordingly.

16. REMOVAL OF WHEEL FROM DRIVE AXLE

Refer to (a) Dana Corporation Spicer Bulletin #8302

(b) RDC General Manual, Section 3, Figures 1 & 3.

Procedure

1. Remove the eight Quill Driving Clamp Screws from each side of the Gear Unit. Lay aside the halves of the compression rings and the lock straps.

2. Remove the two Quill Driving Clamp Bolts from each Axle Mounting Assembly. The Axle Mounting Assembly halves are mated and numbered alike. These parts should be kept mated.

3. Slide the Gear Unit on the axle toward the opposite end from which the wheel is to be removed until it contacts the disc. See Fig. 3.

4. Remove the fasteners that retain the disc to the hub of wheel that is to be removed and slide it against the Gear Unit.

A space of approximately 15 inches now exists between the hub of wheel and disc assembly.

When the axle assembly is placed in the wheel press, "I" beams or other suitable structure of proper weight may now be inserted in this space and secured at top and bottom of wheel press to form an "A" frame straddling the axle so that wheel is backed up across its flanges. Pressure may now be applied to the end of the axle.

Re-install the gear unit as shown in Spicer Bulletin #8302.

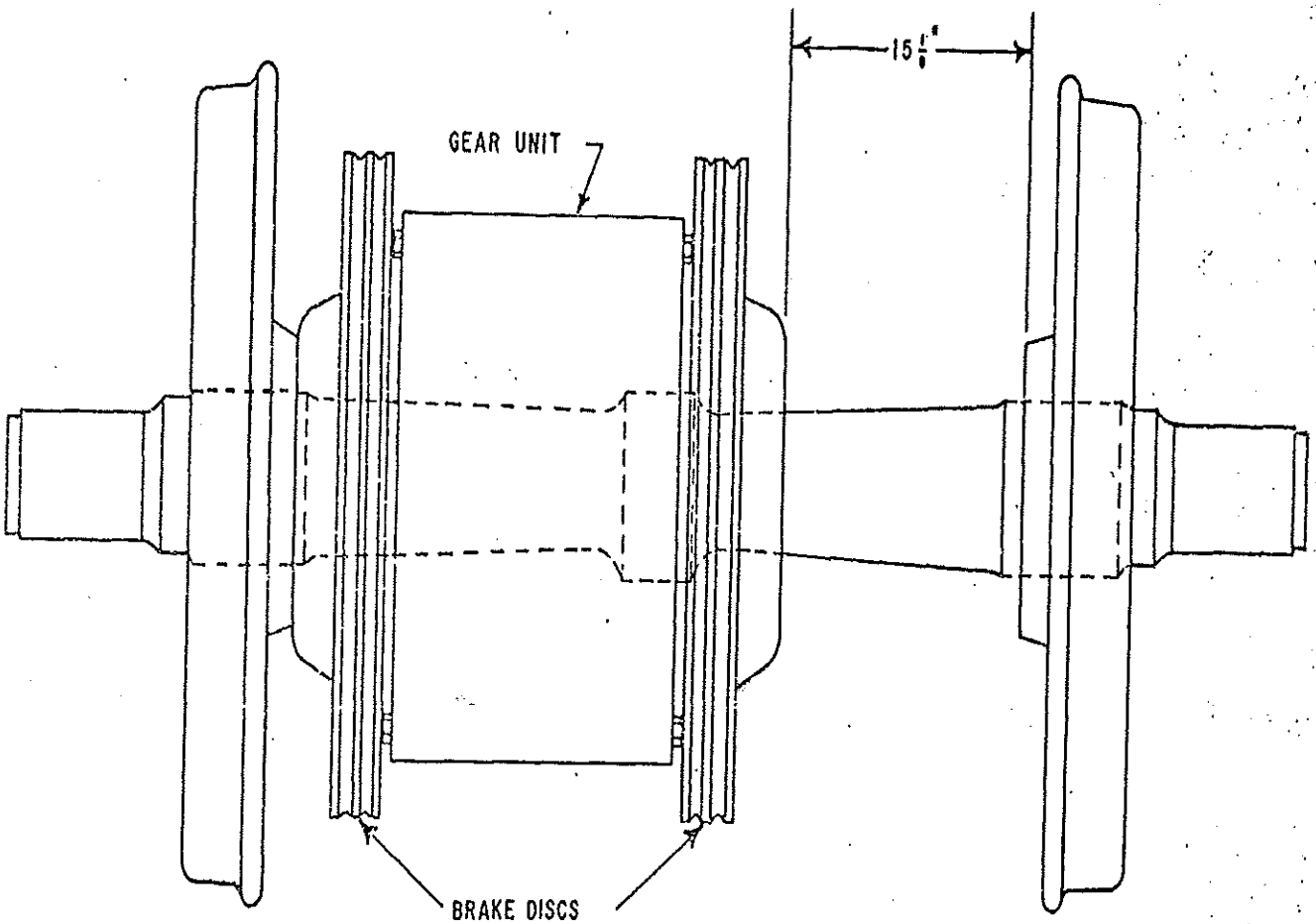
17. JACKING THE CAR

The RDC may be raised by jacking at the jacking pads located at the ends of each bolster.

The car may also be raised by means of a sling attached to the buffer sill. Details concerning the sling and other methods of raising are shown in the "Wreck Master's Manual", copies of which are obtainable from the Wire Rope Sling Department, American Chain & Cable Company Inc., Wilkes-Barre, Pennsylvania

When raising the car, it is not necessary to remove the trucks.

The drive shafts, however, should be disconnected to prevent possible damage.

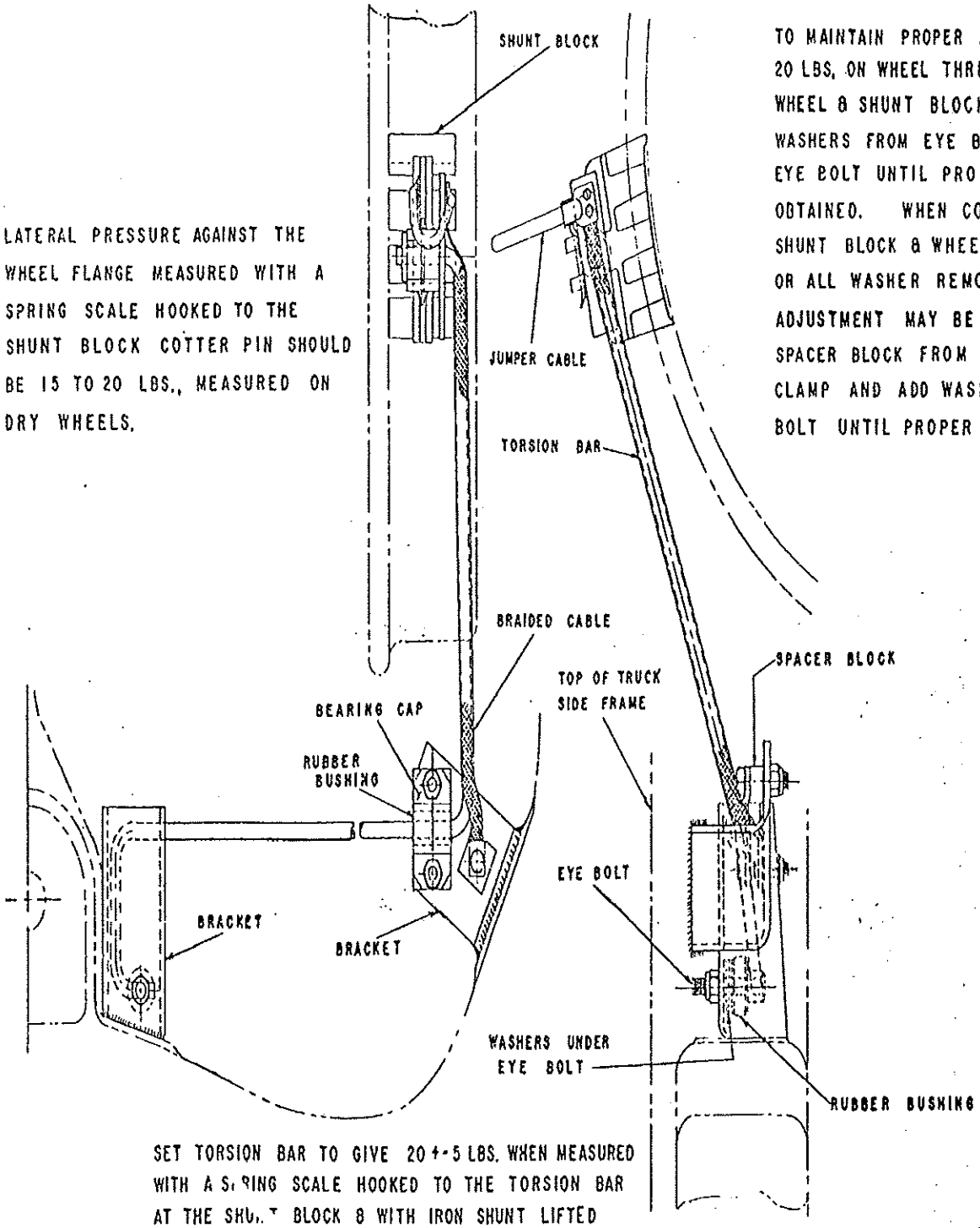


METHOD OF SHIFTING GEAR UNIT ON AXLE

FIG. 3

LATERAL PRESSURE AGAINST THE WHEEL FLANGE MEASURED WITH A SPRING SCALE HOOKED TO THE SHUNT BLOCK COTTER PIN SHOULD BE 15 TO 20 LBS., MEASURED ON DRY WHEELS.

TO MAINTAIN PROPER ADJUSTMENT OF 20 LBS. ON WHEEL THREAD THROUGHOUT WHEEL & SHUNT BLOCK LIFE, REMOVE WASHERS FROM EYE BOLT AND ADJUST EYE BOLT UNTIL PROPER TENSION IS OBTAINED. WHEN COMBINED WEAR OF SHUNT BLOCK & WHEEL REACHES 2 1/4" OR ALL WASHER REMOVED, FURTHER ADJUSTMENT MAY BE HAD BY REMOVING SPACER BLOCK FROM UNDER BEARING CLAMP AND ADD WASHERS UNDER EYE BOLT UNTIL PROPER TENSION IS OBTAINED.



SET TORSION BAR TO GIVE 20 +-5 LBS. WHEN MEASURED WITH A SPRING SCALE HOOKED TO THE TORSION BAR AT THE SHUNT BLOCK & WITH IRON SHUNT LIFTED CLEAR OF WHEEL TREAD. LOAD MUST BE ESTABLISHED WITH TRUCK UNDER READY TO RUN. ADD WASHERS UNDER EYE BOLT AS REQ'D. WITH A MIN. OF 5 WASHERS UNDER RUBBER BUSHING, RUBBER TO HAVE APPROX. 1/16" DEFLECTION.

FIG. 4 SEC. 3

TORSION BAR & SHUNT BLOCK ARRANGMENT

SECTION 4

HANDBRAKE

DESCRIPTION

There is one handbrake per car. This handbrake is a Peacock 24" lever type operating on one brake disc on each axle of the truck adjacent to the handbrake end of the car. It is designed for a drawbar pull of 5500 lbs. with 2100 lbs. appled to each handbrake crank arm.

The handbrake chain operates through a sheave wheel and is attached to an operating rod and lever assembly. The operating rod has a maximum movement of 13 inches and is equipped with a release spring.

SETTING HANDBRAKE

To set the handbrake it is only necessary to operate hand lever upward (pumping action) until the brake is set. It is not necessary to manipulate the trip lever in any way while handbrake is being set.

RELEASING HANDBRAKE

To release the handbrake, return hand lever to its retainer spring clip, push the hand lever as far back as it will go and leave there, but do not push against handle with the foot as this retards the releasing action. Then pull upward and outward on the trip lever, holding it only until the chain weight and its rubber snubber come up against bottom of brake housing. If chain weight and its rubber snubber do not return up to bottom of housing, reset the handbrake and repeat release.

VISUAL CHECK FOR FULL RELEASE

Car should never be operated with handbrake partially applied. To insure this, all operating personnel should make sure the chain weight and its rubber snubber are up against the bottom of the housing. If not, the handbrake should again be fully set and then released.

INSPECTION

Handbrake should be periodically inspected for loose screws, nuts or bolts. EXCEPTION - Hand lever adjusting screw, located on the front edge of the hand lever, near the top, should not be turned except as outlined in the following paragraph.

HAND LEVER CLEARANCE

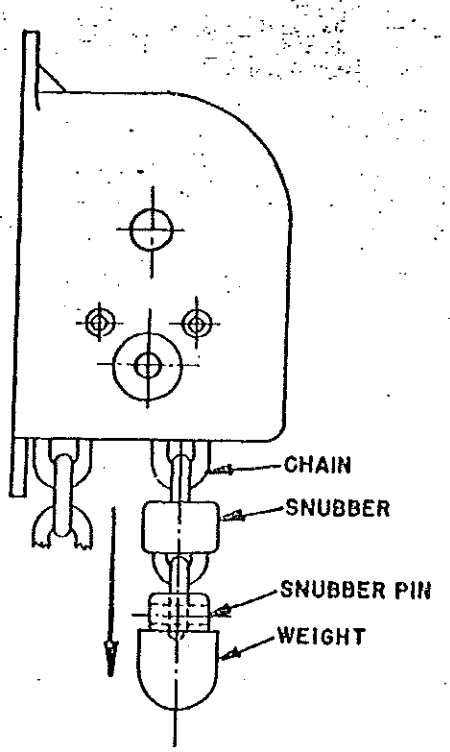
All late models are equipped with a hand lever adjusting screw located in the front edge of the hand lever near the top which, by turning, adjusts the hand lever clearance between the handle and the nearest part of the car structure. Turning this screw clockwise increases the clearance and counterclockwise decreases it. It will seldom, if ever, be necessary to move this screw. However, should it be necessary, the screw should be respiked by center punching the threads into the slot extending across the head of the screw.

REPLACEMENT OF CHAIN

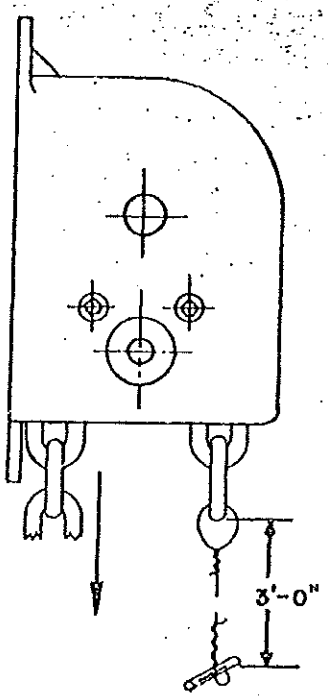
See Figure 1.

LUBRICATION

All rotating or moving parts should be periodically lubricated (See Budd Rail Diesel Car Lubrication and Fuel Chart). Length of time between lubrications will depend on use of the handbrake, operating conditions, climate, etc., but in any event lubrication should be attended to at the same time periodic inspection and attention as given to air brakes as required by A.A.R. rules.



SKETCH Nº 1.



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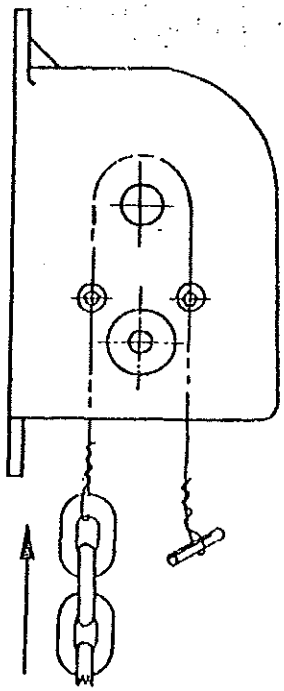


SKETCH Nº 3.

REMOVING CHAIN

1. PULL DOWN WEIGHTED END OF CHAIN.
2. SLIDE RUBBER SNUBBER UP CHAIN AS SHOWN IN SKETCH Nº 1.
3. REMOVE CHAIN SNUBBER PIN.
4. ATTACH PIECE OF BALE WIRE APPROXIMATELY 3 FT. LONG TO LOOSE END OF CHAIN WITH A LOOP OR OTHER MEANS OF PREVENTING THE WIRE FROM PASSING THROUGH THE HOUSING.(SEE SKETCH Nº 2.)

REAPPLYING CHAIN (SEE SKETCH Nº 3.)

1. PULL DOWN ON CHAIN UNTIL WIRE HANGS EVENLY ON BOTH SIDES OF DRUM AS SHOWN.
2. DISCONNECT WIRE FROM OLD CHAIN AND ATTACH TO NEW CHAIN.
3. PULL DOWN HANDLE END OF WIRE AT THE SAME TIME ASSISTING THE OPERATION BY RAISING CHAIN UP AND STARTING IT THROUGH THE HOUSING. CONTINUE THIS OPERATION UNTIL CHAIN HAS BEEN DRAWN ENTIRELY THROUGH HOUSING AND HANGING AS SHOWN IN SKETCH Nº 1.
4. SLIDE SNUBBER UP CHAIN.
5. ATTACH WEIGHT BY INSERTING PIN.
6. SLIDE SNUBBER DOWN OVER THE END OF THE WEIGHT AND CONNECT THE FAR END OF CHAIN TO BRAKE RIGGING.

METHOD OF CHANGING CHAINS

FIG. 1

SECTION 5

COUPLERS, DRAFT GEAR, BUFFER SILLS AND WALKWAY PLATES

DESCRIPTION

The couplers are AAR type H short shank supported by a carrier assembly provided with 3 coil springs. Each spring is seated in a pocket in the end underframe. (See Fig. 1).

The uncoupling mechanism operates from one side of the car only and is accessible at the left hand side when facing the end of the car.

A draft gear of the Waugh type is provided with each coupler and consists of five Waughmat units in the buff section and six units in the draft section. Each Waughmat unit is made up of a steel plate and two rubber mats: a mat attached to each face of the steel plate. Each unit is then separated by a steel dividing plate. (See Fig. 1).

A buffer sill mounted on spring loaded, rubber bushed, side stems, is located at each end of the car. The spring pressure applied against the spring retainer, causes the buffer sill to extend in an outward direction.

A sliding foot plate is hinged from the outer edge of the buffer sill assembly.

A walkway plate having an anti-slip surface, with one end hinged to the threshold and the other end bearing on the top of the sliding foot plate, is provided at each end of the car.

ADJUSTING COUPLER HEIGHT

The couplers should be adjusted so that the distance between the centerline of the coupler and the top of the running rail is between 34 and 35 inches.

To make this adjustment, check that there is no binding at the truck pedestals or elsewhere. Jack up the coupler until sufficient clearance is obtained between the coupler shank and the wear plate of the coupler carrier assembly. Pry up the carrier wear plate and insert a shim. Shims are available in 1/8, 1/4, and 1/2 inch thicknesses.

Remove the jack and recheck the coupler height.

REPLACING COUPLER CARRIER SPRINGS

1. Remove the coupler,
2. Compress the coupler carrier by means of a jack.
3. Remove the two coupler stop lugs.
4. Release the pressure on the coupler carrier and remove the jack.
5. Remove the coupler support assembly and springs.

To install springs, reverse the above procedure.

When coupler carrier is dismantled check the free height of each coil spring. The free height should be 8 inches. If found to be less than 7-27/32 inches, the spring must be replaced.

REMOVING AND INSTALLING WAUGHMAT TWIN CUSHION

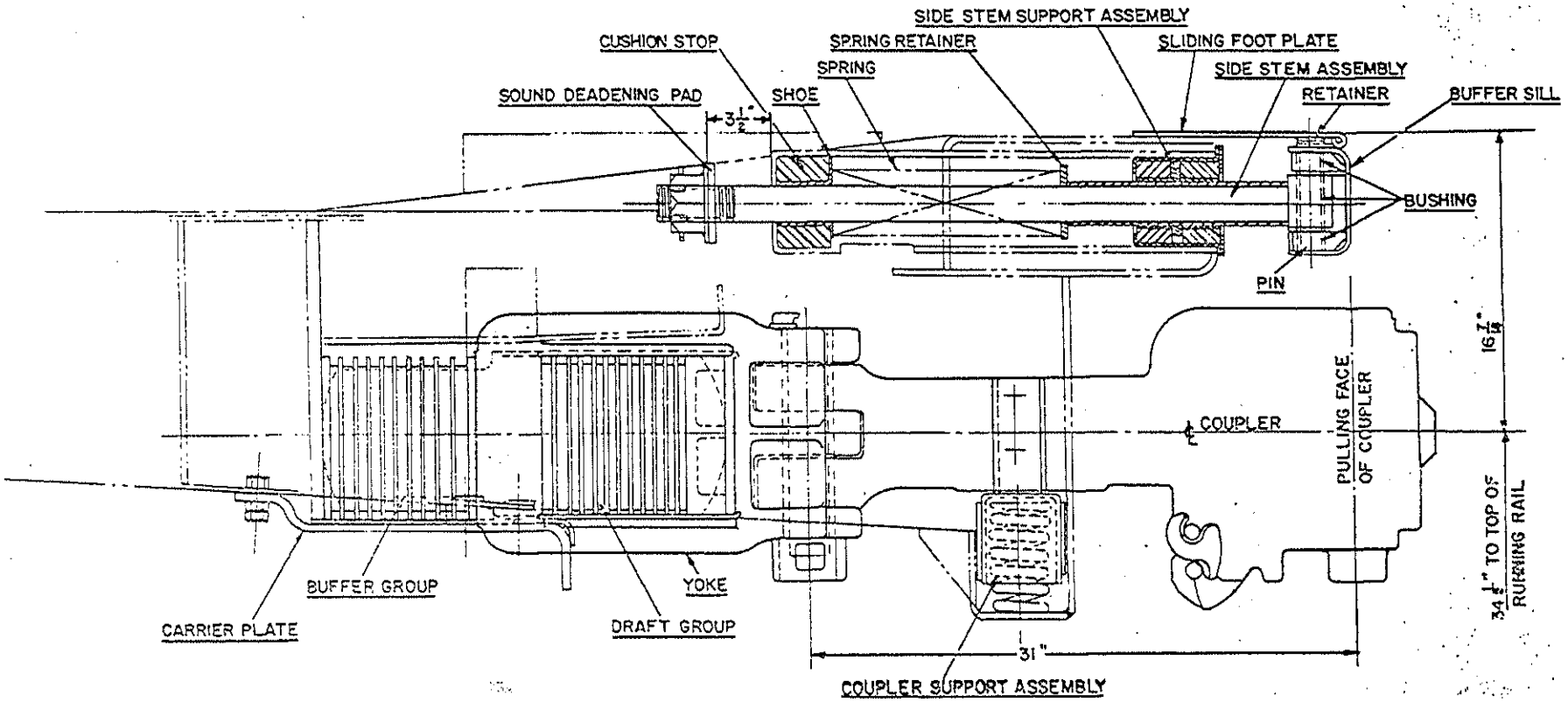
For method of removing and installing Waughmat twin cushion see Fig. 1.

INSPECTION OF BUFFER SILL ASSEMBLY

The top surface of the sliding foot plate must be 16-7/16 inches from the centerline of the coupler, when the centerline of the coupler is 34-1/2 inches above the top of the running rail. (See Fig. 1).

If any variation in the height of the buffer sill requires an adjustment, dismantle and inspect the unit as follows:

1. Compress the buffer sill assembly.
2. Remove the cotter keys, slotted hex nuts and sound-deadening pad.
3. Remove the four hex head bolts and lockwashers which retain each support assembly.
4. Gradually release the compression from the buffer sill assembly to release the pressure from the side stem springs.
5. Slide the buffer sill assembly forward and remove from the car.
6. Remove the support assemblies, spring retainers, and springs.
7. Remove shoes and cushion stops.
8. Clean and examine all metal parts for excessive wear and rubber parts for distortion.
9. Clean and inspect side stem springs for 17.50" free height.



REMOVAL OF TWIN CUSHION

1. REMOVE COUPLER FROM YOKE.
2. PLACE A WOOD PLANK UNDER BUFF GROUP & A PLANK UNDER DRAFT GROUP YOKE WITH CAR JACKS FOR SUPPORT.
3. REMOVE CARRIER PLATE.
4. LOWER JACK UNDER BUFF GROUP FIRST.
5. LOWER JACK UNDER DRAFT GROUP.

INSTALLATION OF TWIN CUSHION

1. ASSEMBLE DRAFT GROUP UNIT IN YOKE, PLACE UNDER POCKET AND JACK IN POSITION SO THAT FOLLOWER CONTACTS FRONT STOPS.
2. ASSEMBLE BUFF GROUP UNDER THE REMAINING PORTION OF POCKET AND JACK IN POSITION, SHIM TO OBTAIN 5/16" PRECOMPRESSION.
3. ATTACH CARRIER PLATE.
4. REMOVE JACKS UNDER BOTH GROUPS.
5. ATTACH COUPLER TO YOKE.

BUFFER SILL AND DRAFT GEAR

FIG.1

10. Remove side stems from the buffer sill as follows:

    a. Lift the hinged foot plate to expose side stem pin retainers.

    b. Remove retainers.

    c. Drive out side stem pins.

    d. Clean and examine pins and bushings for excessive wear. Replace any worn parts.

REINSTALLING BUFFER SILL ASSEMBLY

1. Apply a light coat of lubricant to all pins, bushings, wear surfaces of side stems and inside diameter of the support assemblies and shoes.

2. Place side stems into the buffer sill and insert side stem pins.

3. Apply the side stem pin retainers and securely tighten the attaching bolts.

4. Slide the support assemblies, with the bolting flange toward the buffer sill, onto the side stems. Slide the spring retainers and springs onto the side stems.

5. Apply the shoes to the cushion stops and insert in the side stem pockets in the end underframe. The shoe flange must be positioned as shown in Fig. 1.

6. Insert side stems into the end underframe.

7. Apply pressure while guiding the side stems through the openings in the shoes.

8. Apply the sound deadening pad and turn the slotted hex nut onto the side stem several turns.

9. The two support assemblies are contoured on one side to compensate for angling. This side is indicated by the arrows stenciled on the face of the back plate. Position the support assemblies with the arrows pointing toward the centerline of the car. Apply the eight hex head bolts and lockwashers and tighten securely.

10. Position the face of the buffer sill to the pulling face of the coupler and adjust the slotted hex nuts to the $3\frac{1}{2}$ inch dimension as shown on Fig. 1. Insert the cotter keys and spread the ends.

SECTION 6

AIR COMPRESSOR

The air compressor is a Westinghouse Air Brake Company Type 2-CY3-B two stage operated in the direction indicated by the arrow on the flywheel, with timing belt drive, and provided with flexible connections.

A more detailed description of parts, their function and diagnosis of compressor unit ailments may be found in Service Manual 1D19352-3,5 which may be obtained from Westinghouse Air Brake Company, Wilmerding, Pa. Also, Repair Specification R-26-C, obtainable from the same source, is recommended for compressor overhaul.

DRIVE BELT

The drive belt is enclosed in a plastic case which is made up of two pieces. The two pieces are held together by means of a clamping arrangement which is secured by a toggle latch.

With reasonable attention to pulley alignment and belt tension, long belt life can be expected. When applying a new belt, the pulley alignment should be checked with a straight edge so that equalized tension is applied to the belt. To obtain maximum life from the belt, it is recommended that it be reversed on the pulleys every 6 months to prevent excessive wear or strain at any one point. Timing belts have a natural tendency to run against one flange of the driver pulley. When applying a new belt, the tension should be snug, but not taut. A moderately slack belt will provide longer life than a taut one, but excessive slackness should be avoided.

Never pry a timing belt over the flange of a pulley. The motor mounting bolts should be loosened to provide movement of the motor to aid the application of the belt. The pulleys should be realigned and motor tightened down in position.

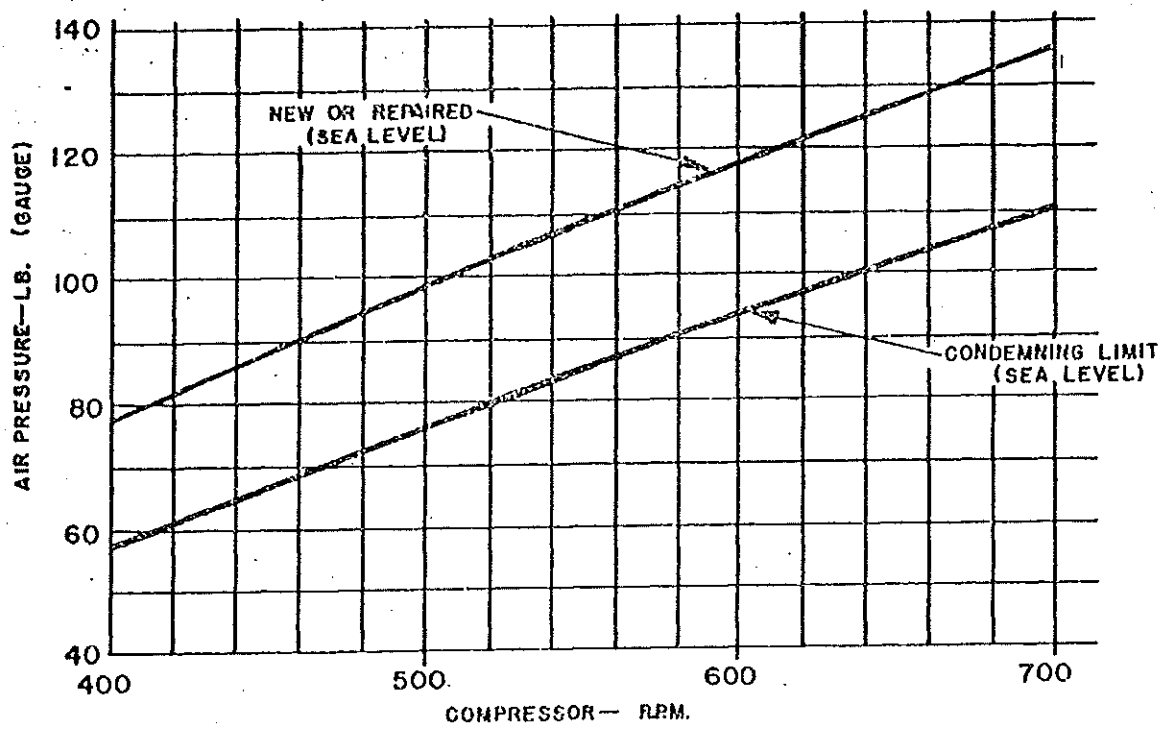
ORIFICE TEST

The following charts, Figures 1 and 2, may be used in testing the Westinghouse Type 2-CY3-B compressor

The test may be performed on the car. An orifice (#37 drill) holder or a pipe union containing the orifice should be applied to the drain cock on the second main reservoir. The compressor is then started and when the reservoir gauge shows approximately the required pressure corresponding to compressor speed, the drain cock to the orifice holder is opened.

Comparing the data obtained from the above procedure with that given on the charts, the condition of the compressor can be determined.

Prior to the tests, it should be established that there is no leakage from the main reservoir system and the compressor should be operated long enough to assure that it is at normal working temperature.



THESE TEST CURVES ARE BASED ON THE FOLLOWING CONDITIONS:

- Nº. 37 DRILL (.1040 IN. DIAMETER) ORIFICE WITH SQUARE EDGES BORED THROUGH PLATE 1/16 IN. THICK.
- VOLUMETRIC EFFICIENCY OF 75% FOR NEW OR REPAIRED AT 100 LB. AIR PRESSURE AND 60% CONDEMNING LIMIT AT 100 LB. AIR PRESSURE.
- RESERVOIR TEMPERATURE 60° F. ROOM TEMPERATURE 70° F.
- ATMOSPHERIC PRESSURE 14.7 (SEA LEVEL).
- FOR HIGHER ALTITUDES DEDUCT 1% FROM PRESSURES ON CURVES FOR EACH 260 FT. ABOVE SEA LEVEL. SEE ALSO FIGURE 2.
- VARIATION FROM THE STATED TEST CONDITIONS WILL CAUSE VARIATION FROM THE GIVEN PRESSURE.

SEE FIGURE 2 FOR INSTRUCTIONS

TEST CHART FOR NEW OR REPAIRED AND CONDEMNING LIMIT
BY ORIFICE TEST METHOD
TWO CYLINDERS, 1 L.P. 5.0 IN. BORE, 3.5 IN. STROKE
1 H.P. 2.5 IN. BORE 3.5 IN. STROKE
TWO STAGE, SINGLE ACTING, AIR COOLED
DISPLACEMENT 25 CU. FT. PER MINUTE
AT RATED SPEED OF 630 COMPRESSOR R.P.M.

FIG. 1

TEST PRESSURES
N°.37 DRILL, .1040 INCH DIAMETER ORIFICE

		PRESSURES (P.S.I.) TO BE MAINTAINED AT VARIOUS ELEVATIONS ABOVE SEA LEVEL.								
RPM \ ELEVATION (FT.)		0	1000	2000	3000	4000	5000	6000	7000	8000
NEW OR REPAIRED COMPRESSORS	400	77	74	71	68	65	62	59	56	53
	450	87	84	80	77	74	70	67	64	60
	500	97	93	90	86	82	78	75	71	67
	550	107	103	99	95	91	86	82	78	74
	600	116	112	107	103	98	94	89	85	80
	650	125	120	115	111	106	101	96	91	87
	700	133	128	123	118	113	107	102	97	92
CONDEMNING LIMIT	400	58	56	54	51	49	47	45	42	40
	450	67	64	62	59	57	54	52	49	46
	500	76	73	70	67	64	61	58	56	53
	550	85	82	78	75	72	69	65	62	59
	600	93	89	86	82	79	75	72	68	64
	650	102	98	94	90	86	82	78	75	71
	700	109	105	101	96	92	88	84	80	75

SEE FIGURE 1. FOR ADDITIONAL INFORMATION

ORIFICE TESTS FOR AIR COMPRESSORS

LIMITING PRESSURES AND SPEED AT SEA LEVEL

FIG.2

SECTION 7

HEATING SYSTEM

The Rail Diesel Cars are heated by the engine cooling water as shown in Figures 1, 2, 3, and 4.

Motor driven pumps are provided to draw water from the engine cooling water tanks and force it through the heating systems and back to the tanks.

The pumps are started and stopped by thermostats to maintain the proper temperature in the car body.

As shown in Fig. 1 (RDC-1, the floor heat pump draws water from the tank of the #2 engine circulating system. It is controlled by a 76° floor heat thermostat located under the tenth seat from the #1 ('B') end of the car.

The overhead heat pump draws water from the tank of the #1 engine circulating system. It forces this water through the overhead heating coil located above the ceiling in the #1 ('B') end of the car. The pump is controlled by a 76° thermostat located just above the fifth anemostat from the #1 ('B') end of the car. A blower is provided which forces a mixture of recirculated and fresh air through the heating coils and into the overhead duct. This air is then distributed into the car body by means of the anemostats located in the center ceiling panel.

The heating control panel (located in the switch locker) has a switch with five positions: HIGH HEAT, LOW HEAT, OFF, COOL, and ANTI-FREEZE. When the switch is in the LOW HEAT position, the car temperature is maintained at approximately 74°. When the switch is in the HIGH HEAT position, the car temperature is maintained at approximately 76°. It is recommended that the HIGH HEAT position be used only when the outside temperature is below 40°.

When the heat switch is in the OFF position, neither pump operates. However, if the overhead blower is kept running, the car will be ventilated. The blower is under control of the blower switch and main lighting breaker.

The ANTI-FREEZE position is used to provide layover heat when the car is parked in the yards (see Standby Provision, Section 7).

As shown in Fig. 2 (RDC-2), the heating system in the passenger section is similar to that in the RDC-1.

Heat is provided in the baggage compartment from the overhead duct and by side wall radiation. A grille located in the partition between the baggage and passenger sections, just over the doorway, is connected to the main discharge duct. This furnishes hot air into the

baggage section from the overhead heat coil. The side wall radiation in the baggage section consists of two banks of side wall radiation directly connected to the floor heat radiation of the passenger compartment and therefore, are under the control of the floor heat thermostat in that section.

As shown in Fig. 3 (RDC-3) the heating system differs in that the overhead heat coil in the coach section and the fan operated unit heater in the RPO section are connected to the #1 heat pump which is under the control of the coach section overhead heat duct thermostat.

It will be noted that a check valve, as shown in Fig. 5, is provided in the branch line supplying the coach section overhead heat coil. The branch line to the RPO fan operated unit heater is connected ahead of the check valve.

During an OFF cycle of the heat pump, the check valve (Fig. 5) remains closed; therefore, no heat is supplied to the coach section overhead heat coil. However, by thermosyphon action plus an augmented flow induced by the engine water pump (when engine is operating) heat is supplied to the RPO unit heater. A hand valve in the return line and located near the unit heater is used to control the heat supplied to the RPO section.

During an ON cycle of the heat pump, the pressure from the pump opens the check valve and allows the water to flow to the coach section overhead heat coil, thus allowing thermostatic control over the heat provided by the coach section overhead heat coil. At the same time, a forced flow is also provided to the RPO unit heater.

The floor heat radiation in the coach section, the fan operated unit heater in the baggage section and the side wall radiation in the RPO section are connected to the #2 heat pump. This pump is under the control of the coach section floor heat thermostat.

It will be noted that a check valve is provided in the branch line to the passenger section floor heat radiation. The branch line supplying the baggage section unit heater and the RPO side wall radiation is connected ahead of the check valve.

During an OFF cycle of the heat pump the check valve remains closed; therefore no heat is supplied to the coach floor heat radiation. However, by thermo-syphon action plus an augmented flow induced by the engine water pump (when engine is operating), heat is supplied to the baggage section unit heater and the RPO sidewall radiation. Hand operated valves are located in the feed lines to each of the units for controlling the heat.

During an ON cycle of the heat pump, the pressure from the pump opens the check valve and allows the water to flow to the passenger section floor heat radiation, thus allowing thermostatic control over the heat provided by the coach floor heat radiation. At the same time, a forced flow is provided to the baggage unit heater and the RPO unit heater and sidewall radiation.

The fan motor of the unit heater in the baggage section is connected to the #2 heat pump motor and is also provided with a THERMO, OFF, MANUAL switch to control the operation.

The fan motor of the unit heater in the RPO section operates according to the temperature selected by the RPO thermostat and a THERMO, OFF, MANUAL switch.

The baggage section also receives heat from the overhead heat duct through a grille in the partition between the passenger section and the baggage section.

As shown in Fig. 4, the RDC-4 baggage compartment heating system consists of a bank of four passses of 1 inch finned radiation 30 inches long mounted on the end wall of the car in the toilet section. In addition, there are two overhead heaters with fans mounted from the ceiling.

The overhead heater toward the #1 ('B' End) of the car and the finned radiation are connected in series; and then to the #1 heating pump. The remaining overhead heater is connected to the #2 heating pump.

The RDC-4 RPO compartment heating system consists of a bank of four passes of 1 inch finned radiation.

Identical heating systems are applied to both sides of the RPO compartment at the distributing table area. The right side system is connected to the #1 heating pump and the left side system is connected to the #2 heating pump.

On the right side wall of the RPO compartment, extending from the mail distributing table to the side mail door is located a bank of two passes of 1 inch finned radiation. Also, there is a bank of 8 passes of 1 inch finned radiation at right angles and adjacent to the mail door. Both of these units are connected in series and then to the #1 heating pump through a check valve.

The operation of this type system is similar to that used on the RDC-3.

During an OFF cycle of the heat pump, the check valve remains closed; therefore, no heat is supplied to the RPO finned radiation. However, by thermo-syphon action plus an augmented flow induced by the engine water pump (when engine is operating) heat is supplied to the finned radiation in the baggage toilet section and to the baggage unit heater nearest the #1 ('B' End) of the car. The two units being connected in series are controlled by a hand valve in the feed line.

During an ON cycle of the heat pump, the pressure from the pump opens the check valve and allows the water to flow to the RPO finned radiation on the right side. At the same time, a forced flow is also provided to the baggage toilet finned radiation and the one baggage unit

heater. The pump is controlled by a thermostat located in the RPO section on the left side under the mail distributing table.

On the left side wall of the RPO compartment, extending from the mail distributing table to the left side mail door, is located a bank of two passes of 1 inch finned radiation. Also, there is a bank of 8 passes of 1 inch finned radiation at right angles and adjacent to the side mail door. In addition there is a single pass of finned radiation along the side wall of the RPO annex and a single pass of 1 inch finned radiation in the annex on the partition adjacent to the regulator locker. The above mentioned left side units are connected in series and then to the #2 heating pump through a check valve.

During an OFF cycle of the heat pump, the check valve remains closed; therefore, no heat is supplied to the RPO finned radiation. However, by thermo-syphon action, plus an augmented flow induced by the engine water pump, (when engine is operating) heat is supplied to the baggage unit heater furthest from the #1 end ('B' end) of the car. A hand valve is provided in the return line and located near the unit heater for controlling the heat.

During an ON cycle of the heat pump, the pressure from the pump opens the check valve and allows the water to flow to the RPO finned radiation on the left side. At the same time, a forced flow is also provided to the baggage unit heater. The pump is controlled by a thermostat located in the RPO section on the left side letter case.

STANDBY PROVISION

In order to provide car heating and prevent freezing of the engines and their cooling water system when the cars are parked with the engines shut down, a 1-1/2 inch steam trainline is used to provide standby heat. This steam trainline is provided with shut-off valves, either rubber hose or flexible metallic connectors and standard steam couplers on each end of the car. If the cars are operated in multiple, the steam connections can be made up between cars and it is only necessary to connect steam to the end car.

Steam from this trainline is injected directly into each of the sump tanks through a Steam Admission Thermostatic Valve mounted on the immersion heater cover plate at the engine end of the sump tank (See Fig. 6). The valve is set for 176°.

Both heating pumps are under control of the layover thermostat and operate at its demand to maintain a temperature of 60° in the car. The circulation of water, together with thermo-syphon action in the engines, prevents freezing of any part of the engine cooling system or car heating system. It also keeps the engines at a temperature which permits quick and easy starting.

CAUTION: On the RDC-3 and 4, it is important that all hand operated shut-off valves in piping to heating units are open to provide complete anti-freeze protection.

The blower on the overhead heat coil must be shut down during the layover period. A separate blower switch is provided on the heating and cooling control panel and is under control of the master light switch.

STANDBY PROTECTION WITHOUT STEAM

Protection may be provided when steam is not available by operating both engines with throttle in #2 position, on the following schedule:

Outside Ambient Temperature	Schedule of Engine Operation
35°	One hour during every 8 hours
15°	One hour during every 6 hours
0°	One hour during every 4 hours
-15°	One hour during every 3 hours

CAUTION: Set handbrake, make an air brake full service reduction and properly chock wheels as the #2 throttle position is a power position.

HEATING PUMPS (RDC-1, 2, 3 and 4)

Both pumps (floor heat and overhead heat) are of the centrifugal impeller type directly connected to a 1/3 H.P., 64 Volt D.C., 3450 r.p.m. motor. (See Fig. 7).

Each pump is mounted on a bracket attached to the side sill of the car and located between the sump tank and engine casing.

The motors have grease packed ball bearings and should be lubricated every 10,000 miles, winter only. (See Budd Rail Diesel Car Lubrication and Fuel Chart). Use caution not to over-grease.

These pumps are Vapor #1546-2300 as shown on Fig. 7.

Both heating pumps should be removed during the summer season and overhauled. The heating lines on the car should be capped to prevent the entrance of dirt. The pump portion should be removed and the impeller inspected for corrosion or pitting. The water seal should be replaced by a new one. Carbon brushes, pig tails, and commutators should be examined carefully. The motor windings should be blown out with dry air and examined for abrasion, etc.

TO REPLACE WATER SEAL (See Fig. 7)

NOTE: Be sure seal specification is Vapor #1541874S.

1. Remove suction head of pump by removing 4 bolts.

2. Check end play of motor shaft. If end play is over 1/64 inch, check motor bearings.

3. Remove impeller nut and washer.

4. Pull impeller off motor shaft.

5. Remove floating seat and sealing washer.

6. Remove seal assembly from shaft of impeller.

7. Make sure that the synthetic rubber seat ring of the new seal is tight against the shoulder of the floating seat with rounded outer edge exposed to facilitate insertion. (The ring is assembled this way when shipped).

8. Oil the outer surface of seat ring and push assembly into cavity, seating it firmly and squarely.

9. Clean and oil the sealing face.

10. Check end of impeller hub and see that there are no burrs to cut rubber bellows when it is slid into place.

11. Oil impeller hub and push bellows and spring assembly into position. Be sure the spring slips over the centering washer and that the driving notches of the sealing washer index with the tabs on the retainer shell.

12. Check key-way on motor shaft and impeller for burrs.

13. Slide impeller on motor shaft with key in place. (Note:- This should be done with the motor shaft in vertical position to insure spring of seal remaining in proper position on the centering washer until the sealing faces meet).

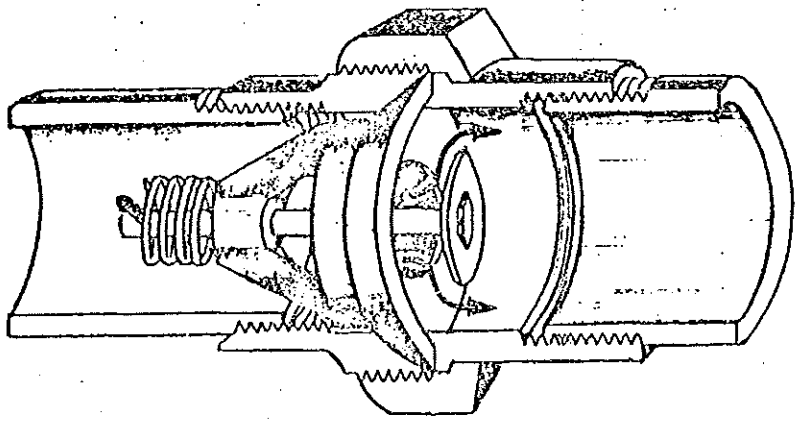
14. Install impeller washer and nut. Tighten latter securely. Be sure that the impeller hub fits tightly against the shoulder on the motor shaft.

15. Replace gasket on suction head. (Note:- This gasket must be same thickness as original as it determines the clearance between impeller and suction head). Install suction head.

16. Rotate motor shaft by hand to check that all parts turn freely.

CAUTION: Do not run pump dry as this will damage sealing surfaces of the water seal.

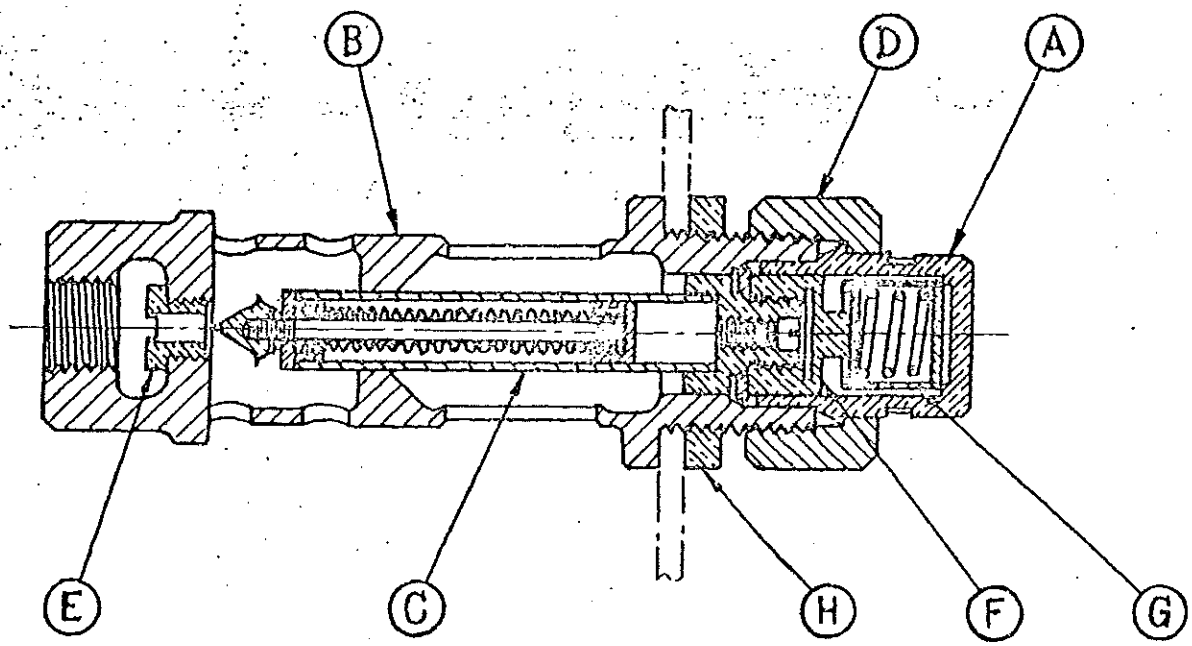
FROM THE PUMP



TO THE HEAT RADIATORS

UNION CHECK VALVE

FIG. 5



LIST OF PARTS	
Sym.	Description
A	ADJUSTMENT HEAD
B	BODY
C	CARTRIDGE ASSEMBLY
D	ADJUSTING NUT
E	SEAT
F	ADJUSTMENT SPACER
G	OVERRIDE SPRING ASSEMBLY
H	LOCKNUT

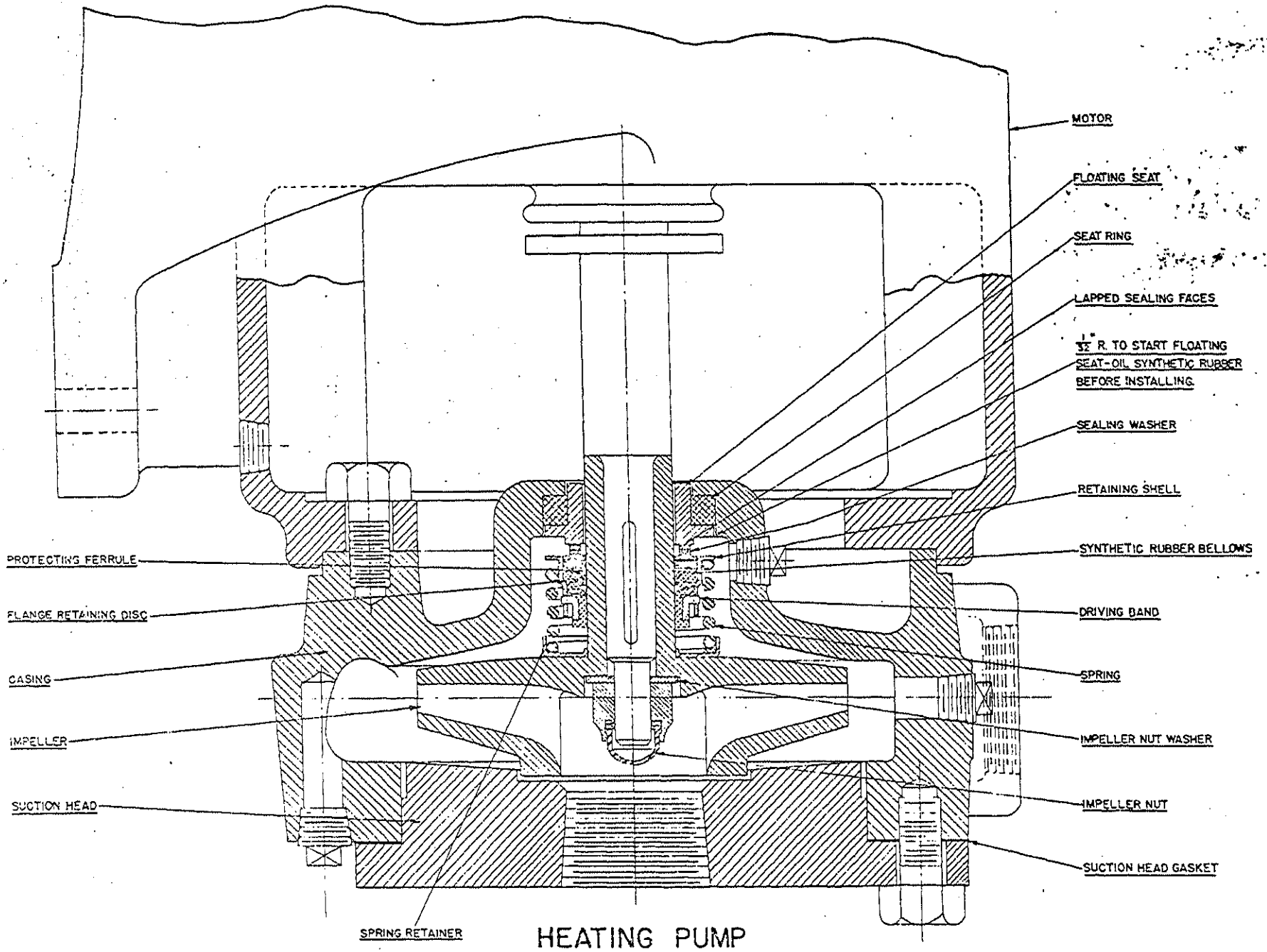
Adjustment Instructions

Loosen Adjusting nut "D" about one-tenth of a turn and turn adjustment head "A" slowly and a little at a time until the correct position is found. To raise temperature, turn "A" clockwise; to lower turn anti clockwise. When making any adjustment, "A" should be moved only one-sixth of a turn at a time and sufficient time should be allowed after each adjustment to make certain of the resultant temperature change. At least ten minutes should be allowed to establish the true result of the adjustment. After each adjustment, tighten Adjust Nut "D".

If proper results are not obtained by following the above mentioned procedure, the Cartridge Assembly "C" and Seat "E" should be replaced.

The above mentioned procedure should be followed for setting after new parts are installed.

STEAM ADMISSION THERMOSTATIC VALVE
Vapor No. 9331 Temperature Regulator
FIG. 6



HEATING PUMP

FIG. 7

CHECK VALVE (Spring Check Valve with Large Bore) Fig. 5

On the RDC-1 and 2, a check valve is located in the discharge line of both the floor heat and overhead heat pumps. They are used to prevent false heating by thermo-syphon action when heating is not required.

On the RDC-3 and 4, the check valves are used in the discharge line of each pump but located so as to prevent thermo-syphon action to sections where thermostatic control is desired and not permit thermo-syphon action to sections where manual control is desired.

The check valve consists of an assembly inserted into a beveled seat union. When installing the check valve in the union be careful not to get the check valve off-center, which would result in a stuck open or closed valve. The valve has a spring check which prevents the flow of water as long as the pump is shut down. However, the pressure developed by the pump is sufficient to open the check and allow hot water to circulate.

Foreign particles in the engine cooling system can lodge in the check valve and keep the valve open, resulting in thermo-syphon action when the heat pump has cycled off. The valve should be removed annually and examined for cleanness and wear. The spring should be examined and checked that sufficient pressure is exerted to hold valve firmly against valve seat.

FLOOR HEAT RADIATION

The floor heat radiation in the RDC-1, 2, and 3 consists of one run of fin radiation, 48 fins per foot, full length of each passenger section, on each side with an additional six feet at each end of the car. A drain petcock is provided at the low point on each end for draining any water that may lie in the radiation, if the car is to be parked without standby heat.

OVERHEAD HEAT COIL

RDC-1, 2 and 3 only. The overhead heat unit is a two-pass coil made a part of, and bolted to, the evaporator unit. It is a standard Safety Industries coil as furnished with their evaporator. The water enters the lower connection of the coil, and leaves by the upper connection. A petcock is installed in the top of the main header to bleed off any air that may be trapped. Normally it is not necessary to use this bleeder petcock since pump operation will purge the coils, unless the car is standing with a heavy lean. Since this coil is a part of the evaporator unit, removal is explained under "Cooling System".

FLOOR HEAT THERMOSTAT

RDC-1, 2 and 3 only. This thermostat is located under the

tenth seat from the #1 ('B') end of the car and controls the starting and stopping of the #2 heat pump. It is provided with a setback resistor which lowers its setting to 74°. Another setback to 60° controls the operation of both the #1 and #2 heat pumps during layover.

OVERHEAD HEAT THERMOSTAT

RDC-1, 2 and 3 only. This thermostat is set for 76°. It is located in the air discharge duct, above the fifth anemostat from the #1 ('B') end. This thermostat is provided with a setback resistor which corrects its setting to 73° for LOW HEAT and 75° for HIGH HEAT.

CONTROL PANEL

The control of the heating system is integral with the control of the cooling system and is incorporated in the air conditioning control panel located in the bottom of the switch locker in the #1 ('B') end of the car.

UNIT HEATER

The unit heater used in the mail and baggage compartments of the RDC-3 consists of a fin coil with a motor driven fan to circulate air over the coil and through the compartment. The heaters are mounted near the ceiling in the end of each compartment.

On the RDC-4 there are two unit heaters mounted from the ceiling in the baggage compartment. These heaters consist of a fin coil with a motor driven fan to circulate air over the coil and through the compartment.

The unit heater coils should be blown out with compressed air every six months. The best method is to direct the air blast through the coil in the opposite direction to the normal operating air flow. The fan blades and motor should be blown off and wiped clean. Care should be taken that all dirt is removed from around the lubricating openings before adding lubricant.

The unit heater fan motors in the RDC-3 are equipped with factory sealed ball bearings. See Budd Rail Diesel Car Lubrication and Fuel Chart.

The unit heater fan motors in the RDC-4 are equipped with factory sealed grease lubricated ball bearings. This type of bearing requires no periodic attention and is replaced when it becomes noisy or worn out.

The motor brushes should be checked periodically for wear and that they are free in the holders. Replacement brushes should be of the same grade as recommended by the motor manufacturer and should be obtained from that company.

BALANCING DISCS

Balancing discs having pre-determined size orifices are located in some lines to provide a balanced flow between heating units. These orifices are located in standard unions and must not be removed.

In case a heating unit should fail to heat and it is determined that controls, heat pump, and valves are in proper condition, and that the system is properly purged of air, a stoppage at the orifice may be suspected.

The lagging must be removed at the union and the union broken. The orifice may then be removed by lifting it out with a piece of wire bent to form a hook. Any foreign material found in the orifice should be removed. With the union open and the orifice removed, the line may be purged of any remaining foreign material by operating the heat pump for ten seconds. The orifice may then be replaced, union made up and checked for leaks, lagging replaced on pipe, and water added to sump tank if required.

The orifices are located as follows:

RDC-1 - 1/2 inch floor heat return behind No. 2 engine sump tank adjacent to vertical pipe support angle.

RDC-2 - 1/2 inch floor heat return behind No. 2 engine sump tank adjacent to vertical pipe support angle.

RDC-3 - 1/2 inch floor heat return behind No. 2 engine sump tank adjacent to vertical pipe support angle.

- 7/32 inch RPO sidewall radiation return, adjacent to the left of the service water fill spud.

- 1/4 inch baggage section unit heater, in return line union at heater unit.

RDC-4 - 5/16 inch RPO sidewall radiation at mail distributing table has two orifices in return lines above floor.

STEAM ADMISSION THERMOSTATIC VALVE

The valve consists of a steam dispersing tube with a built-in thermostatic element to control the steam and is located on the immersion heater cover plate at the engine end of each sump tank.

The valves are set to maintain a water temperature of 176° in the tank. An adjustment head is provided for varying the temperature setting (See Fig. 6).

A shut-off valve is installed in the steam line to each valve plus a strainer to remove dirt, scale, etc.

The steam admission thermostatic valves handle the trainline steam pressure without the use of regulating valves.

STEAM TRAPS

A Vapor S-155 steam trap is provided on the steam trainline of each RDC car. The trap permits condensate to drain out but retains steam in the line, thus preventing possible freezing.

It is located on the #2 ('A') end of the battery box on the RDC-1, 2 and 3, and at the forward end of the No. 1 engine sump tank on the RDC-4.

The trap should be disassembled for overhaul and inspection for wear at every shopping period or at least once every two years. The trap should be checked for operation before the beginning of each heating season.

Steam blowing from the drain outlet of the trap indicates a ruptured bellows diaphragm which must be replaced, dirt between the valve and seat, or a needle valve which is not seating properly.

To disassemble the trap for overhaul or inspection, remove the four hex head bolts and remove the diaphragm cover and the diaphragm cover gasket. The bellows diaphragm may then be detached from the diaphragm cover. The strainer cap, located on the opposite side of the valve from the bellows, may then be unscrewed and the strainer removed. The needle valve assembly and gasket may then be removed.

The diaphragm cover gasket must be replaced if worn or damaged. Test the bellows diaphragm for leaks - see Bellows Diaphragm Testing and Inspecting. The valve and seat should be inspected for wear, scoring or wire drawing. Strainer must be clear of scale and foreign material.

Clean each part thoroughly and reassemble the trap, using new or repaired parts where required. Test the trap on the steam line before re-applying it to service.

Bellows Diaphragm
Inspecting and Testing

To inspect a bellows diaphragm, apply steam to the assembled trap, then shut off steam and allow about five minutes for the bellows diaphragm to cool and contract. Remove the bellows diaphragm from the trap and if the bellows has failed to return to its normal fully contracted form when cool, it is defective and should be replaced.

To test a bellows diaphragm for leaks, place the unit in a suitable holding fixture and submerge in water at about 190° F. Leaks will be indicated by bubbles rising in the water. A leaky bellows diaphragm should be discarded. A suitable holding fixture for conducting this test is shown on Vapor drawing #22659, copies of which are available from Vapor Corp. upon request.

CAUTION: Do not remove the bellows diaphragm from the trap or holding fixture while hot, nor subject it to live steam when not enclosed, as it will become over-expanded and will not return to its normal form.

RDC-1 and 2 HEATING CONTROLS (See Wiring Schematics)

The heating panel for RDC-1, 2 and 3 is provided with the following:

a. Control switch with positions HIGH and LOW HEAT, OFF, COOL and ANTI-FREEZE.

b. Blower fan circuit breaker switch.

c. Floor heat pump relay (FHPR)

d. Overhead heat pump relay (OHPR

e. Cooling pilot relay (CPR)

f. Cooling modulating relay (CMR)

The thermostats are:

a. Overhead heat DN2501 - 76°.

b. Floor heat FCN2501 - 76°.

Low Heat

When the control switch on the heating control panel is moved to Low Heat position, contacts 2, 3, 4, 7 and 9 are closed.

a. Closing contact #2 places the TROH relay coil and the two 1000 ohms resistors in the circuit.

b. Closing contact #3 adds mercury tube thermostat across the TROH coil.

c. Closing contact #4 places the TRFH coil and the two 1000 ohm resistors in the circuit.

d. Closing contact #7 inserts the 3° setback resistor in the circuit with the heater element of the mercury thermostat 2501 OH.

e. Closing contact #9 inserts the 2° setback resistor in the circuit with the heater element of the mercury thermostat 2501 FH.

With the electrical circuit set up as mentioned above, the setback resistor allows a small current to flow in the heating element of the floor heat mercury thermostat. This small current creates sufficient false temperature on the mercury tube to reduce its operating temperature 2°, thereby causing it to operate at 74° instead of 76°.

The same conditions are set up for the overhead heat thermostat except the setback resistor is such that a 3° false temperature is produced. This reduces the operating temperature to 73° instead of 76°.

When the mercury connections are open, due to lowered temperature, the shunt is broken across the relay coils. Current flowing through the TRFH and TROH coils will energize them and close the respective relay contacts, starting the water pumps. When the car temperature rises to 73° the overhead mercury thermostat closes and shunts the TROH coil, causing the relay contacts to open, thus shutting off the overhead pump. The floor heat pump will continue to run until the car temperature rises to 74°. At this temperature the mercury thermostat closes and shunts the TRFH coil, causing the relay contacts to open, thus shutting off the floor heat pump.

High Heat

When the control switch on the panel is moved to High Heat position, contacts 2, 3, 4, and 6 are closed. The closing of contacts 2, 3, and 4 set up circuits as mentioned in items (a), (b), and (c) under "Low Heat". The closing of contact 6 inserts the 1° setback resistor in the circuit with the mercury thermostat 2501 OH heater coil. The overhead heater thermostat now operates at 75° instead of 76°. The action of the setback circuit is described under "Low Heat".

The floor heat thermostat will have no circuit connected to the heating element of the mercury thermostat. The switch contact #4 will place the TRFH 8160 in the circuit, allowing it to operate at the 76° thermostat setting.

Anti-Freeze

When the control switch on the heating control panel is moved to the "Anti-Freeze" position, contacts 4, 5, and 8 are closed.

a. Closing contact #4 places the TRFH coil and the two 1000 ohm resistors in the circuit.

b. Closing contact #5 connects the FP4 of the TRFH relay to one side of the #2 switch. This feeds battery positive (+) to the TROH relay coil when the TRFH contacts are closed.

b. cont'd.

In the Anti-Freeze position, the #2501 floor heat thermostat controls the heat in the car. With the circuit setup as in (b) above, the floor heat thermostat energizes the TRFH relay; the contacts of the TRFH close, starting the floor heat pump. Battery positive ( ) through the #5 switch, energizes the TROH relay, closing TROH contacts and starting overhead heat pump.

c. Closing contact #8 places the 16° setback resistor in series with the heater element of the floor heat mercury thermostat. The false heat created by the current through the resistor reduces the operating temperature from 76° to 60°.

Although the overhead heat pump operates to protect piping, the fan is not operated to heat the car in the Anti-Freeze position.

STEAM LAYOVER PROTECTION FOR RDC-1 AND 2

1. Check the heating and cooling control panel (located in the switch locker at the #1 ('B') end of the car) to see that the selector switch is in the ANTI-FREEZE position and the blower switch is in the OFF position.

2. Turn off all lights in the car by tripping the master switch at the top of the switch panel.

3. Check that the hand valves ahead of the Steam Admission Thermostat Valves (located in the supply lines to each sump tank) are in the open position.

4. Check that the water level in both engine sump tanks is between the upper two try-cocks.

5. Plug in a source of 64 volts battery charge. CAUTION - Be sure both engines have been shut down before the plug is inserted. DO NOT start either engine without first pulling the battery charge plug.

6. Couple one end of the steam trainline to yard steam and open the end train pipe valve.

7. Open the end train pipe valve on the opposite end of the car to blow out any condensate, then partly close the valve, leaving a feather of steam blowing out of the coupling.

8. Check for rumble of steam at both sump tanks, indicating that steam is entering the water.

9. Check that floor heat and overhead heat circulating pumps operate when car body temperature falls below 60°.

Removing Car from Yard Steam (RDC-1 and 2)

1. When removing car from layover steam protection close train pipe valve, disconnect yard steam line and then open train pipe valve on opposite end of car to blow out any condensate.

2. Disconnect 64 volt battery charge cable.

3. Check engine water temperature gauge to verify that engine water temperatures are normal before starting engines.

Steam Heating When Being Towed in a Conventional Passenger Train (with passengers) (RDC-1 and 2)

1. Check that the hand valves ahead of the Steam Admission Thermostat Valve (located in the supply lines to each sump tank) are in the open position.

2. Check that the water level in both Engine Sump Tanks is between the upper two try-cocks.

3. Couple the steam trainlines and open the end train pipe valves. If the RDC is being towed between cars, open both end train pipe valves. If being towed as a rear end car, open the forward train pipe valve and partly open rear end train pipe valve to permit a feather of steam to blow out of the coupling.

4. One engine must be operating to provide battery charging. The engine stop and isolation switch (located in the respective regulator locker) must be in the "ISOLATE" position to isolate the engine controls. It is not necessary to "ISOLATE" the shutdown engine from its respective regulator locker.

5. Insert the master plug switch in the receptacle (located in the collision post at the controller) at either end of the car for air compressor operation. Do not insert the reverse lever in the controller.

6. Snap the main lighting breaker and the blower switch to the "ON" position. Set the selector switch on the heating and cooling control panel for HIGH or LOW, depending on the requirement.

Steam Anti-Freeze Protection When Being Towed in a Conventional Passenger Train with Both Engines Shut Down (no passengers) RDC-1 and 2).

1. Check that the hand valves ahead of the Steam Admission Thermostat Valves (located in the supply lines to each sump tank) are in the open position.

2. Check that the water level in both engine sump tanks is between the two upper try-cocks.

3. Check the heating and cooling control panel (located in the switch locker at the 'B' end of the car) to see that the selector switch is in the ANTI-FREEZE position and the blower switch is in the OFF position. (This places the floor heat and overhead heat circulating pumps under control of the 60° layover thermostat).

4. Check that the floor heat and overhead heat circulating pumps operate when the car body temperature falls below 60°.

5. Turn off all lights in the car by tripping the master switch at the top of the switch panel.

WARNING: If steam is not available, see Draining Instructions Section 23.

RDC-3 BAGGAGE AND RPO HEATING CONTROLS

The heating control panel is located in the utility locker in the RPO compartment. The selector switch has three positions: ANTI-FREEZE, LOW HEAT, and HIGH HEAT. The Anti-Freeze position selects 60° temperature, Low Heat 71° temperature, and High Heat 74° temperature.

One thermostat containing the three temperature ranges is located on the end of a letter case in the RPO compartment.

The fan control switches for the RPO and Baggage unit heaters are mounted, one on each heater housing. These switches have three positions: THERMO, OFF and MANUAL for selecting the fan operation of the unit heaters.

As shown on Wiring Schematic, with the RPO fan control switch set in THERMO position, the heating control selector switch set for Anti-Freeze and the compartment temperature below 60°, the following circuit will be set up: Battery current will flow from the battery positive through the 2.8 Amp. Fusetron, the 1000 ohm resistor, through the relay coil (the 60° mercury thermostat being open), the second 1000 ohm resistor, the 2.8 Amp. Fusetorn to B-. The relay coil being energized, closes the contacts and sets up a circuit from battery positive through one pole of the control switch, the fan motor, the second pole of the control switch to battery negative starting the fan motor.

As the temperature in the compartment rises, the 60° thermostat closes. With the mercury thermostat and selector switch in series across the relay coil, the coil is shunted, de-energizing the relay and opening the contacts. This breaks the battery positive circuit shutting off the fan motor.

The sequence of operation is the same on the two higher temperature ranges.

With the fan control switch (in the baggage compartment) in the THERMO position, a circuit is set up from battery negative through the 2.8 amp. Fusetron, one pole of the control switch, the fan motor, the second pole of the control switch, the second 2.8 amp. Fusetron, through wire FP to terminal .

Due to the action of the 76° floor heat thermostat, the TRFH relay contacts will close, completing the battery positive circuit to the fan motor and causing the motor to run under the thermostat control with the pump motor.

With the fan control switch (Baggage or RPO) in the OFF position, the fan motor is isolated from both positive and negative circuits.

With the fan control switch (Baggage or RPO) in the MANUAL position, a circuit is set up from battery negative, through the 2.8 amp. Fusetron, the fan motor, the second 2.8 amp. Fusetron to battery positive. This places the fan motor in continuous operation.

STEAM LAYOVER PROTECTION FOR THE RDC-3

1. Check the heating control panel (located in the utility locker) to see that the selector switch is in the desired position.

2. See that the fan control switches (Baggage and RPO) are in the THERMO position.

*3. On the RDC-3 it is IMPORTANT that ALL hand operated shutoff valves in piping to ALL heating units are open to provide complete ANTI-FREEZE PROTECTION when car is in "Steam Layover Protection When Being Towed in a Conventional Passenger Train with Both Engines Shut Down (no passengers)."

4. Follow procedures as outlined for RDCs 1 and 2.

RDC-4 HEATING CONTROLS

The heating control panel containing the 20 amp. circuit breaker, pump Fusetrons, 6B-8160 pump relays and the temperature selector switches, is located in the utility locker at the #2 ('A') end of the car. The selector switches have three positions - ANTI-FREEZE, LOW HEAT, AND HIGH HEAT. The anti-freeze position selects the 60° temperature, Low Heat the 71° temperature, and High Heat the 74° temperature.

Two thermostats, each containing the three temperature ranges, are located in the RPO compartment. One thermostat is located under the mail distributing table and the other on the left side paper boxes.

*THIS IS IMPORTANT

A fan control switch is located near the desk in the baggage compartment for the control of the nearest unit heater fan. Another fan control switch is located over the water cooler at the end of the baggage compartment for the control of the unit heater fan at that end of the car. These switches have three positions marked: THERMO, OFF, and MANUAL for selecting the fan operation of the unit heaters.

The heating of the entire car is controlled by the two thermostats located in the RPO compartment. The two electrical control circuits are identical in operation.

As shown on Wiring Schematic with the 20 Amp. circuit breakers closed, a selector switch in the 60° position and the car temperature below 60°, the following circuit will be set up: Battery current will flow from battery positive through the 1000 ohm ballast resistor, the 6B-8160 relay coil, the 1000 ohm ballast resistor, the 6B-8160 relay coil, the 1000 ohm ballast resistor to battery negative. The 6B-8160 pump relay coil being energized, closes the 6B-8160 contacts.

A circuit is now set up to the pump motor as follows: Battery positive flows through the 20 Amp. circuit breaker, the 6B-8160 pump relay contacts to OP+, the pump motor windings to OP-, the 8 Amp. Fusetron to battery negative starting the pump motor.

As the temperature in the car rises, the 60° mercury thermostat closes. With the mercury thermostats and the selector switch in series across the relay coil, the coil is shunted, de-energizing the relay and opening the contacts. This breaks the battery positive circuit, shutting off the pump motor.

The sequence of operation is the same on the two higher temperature ranges.

With a fan control switch (in the baggage compartment) in the THERMO position, a circuit is set up from battery negative through the 8 Amp. Fusetron to OP-, the 2.8 Amp. Fusetron, one pole of the control switch, the fan motor, the second pole of the control switch, the second 2.8 Amp. Fusetron to OP+ and to one side of the 6B-8160 relay contacts.

When the 6B-8160 relay coil is energized by its controlling thermostat, the contacts close, completing the circuit to battery positive. This provides battery positive to both fan and pump motors so that both cycle under thermostatic control.

With the fan control switch in the OFF position, the fan motor is isolated from both positive and negative circuits.

With the fan control switch in the MANUAL position, a circuit is set up from the battery negative through the 2.8 Amp. Fusetron, one pole of the control switch, the fan motor, the second pole of the control switch, through Z+ , through the 20 Amp. circuit breaker (in switch locker) and to B+ . This places the fan motor in continuous operation.

STEAM LAYOVER PROTECTION FOR THE RDC-4

1. Check the heating control panel (located in the switch locker at the 'A' end of the car) to see that the main control breaker is ON and that both selector switches are on ANTI- FREEZE.

2. Check that the two fan control switches near the desk in the baggage compartment are on THERMO.

*3. On the RDC-4, it is IMPORTANT that ALL hand operated shut-off valves in piping to all units are open to provide complete ANTI-FREEZE PROTECTION.

4. Turn off all lights in the car by tripping the master switch.

5. Check that the hand valves ahead of the #9331 steam admission thermostatic valves (located in the supply lines to each sump tank) are in the open position.

6. Check that the water level in both engine tanks is between the upper two try-cocks.

7. Plug in a source of 64 volts battery charge. CAUTION - Be sure both engines have been shut down before the plug has been inserted. DO NOT start either engine without first pulling the battery charge plug.

8. Couple one end of the steam trainline to yard steam and open the end train pipe valve.

9. Open the end train pipe valve on the opposite end of the car to blow out any condensate, then partly close the valve, leaving a feather of steam blowing out of the coupling.

10. Check for rumble of steam at both sump tanks (if temperature is below 176°) indicating that steam is entering the water.

11. Check that both heat circulating pumps operate when car body temperature falls below 60°.

Removing Car from Yard Steam (RDC-4)

1. When removing car from layover steam protection, close train pipe valve, disconnect yard steam line and then open train pipe valve on opposite end to blow out any condensate.

2. Disconnect 64 volt battery charge cable.

3. Check engine water temperature gauge to verify engine water temperatures are normal before starting engines.

Steam Heating When Being Towed in a Conventional Passenger Train (with crew) RDC-4)

1. Check that the hand valves ahead of the #9331 steam admission thermostat valve (located in the supply line to each sump tank) are in the open position.

2. Check that the water level in both engine sump tanks is between the upper two try-cocks.

3. Couple the steam trainlines and open the end train pipe valve. If the RDC is being towed between cars, open both end train pipe valves. If being towed as a rear end car, open the forward train pipe valve and partly open rear end train pipe valve to permit a feather of steam to blow out of the coupling.

4. One engine must be operating to provide battery charging. The engine stop and isolation switch (located in the respective regulator locker) must be in the ISOLATE position to isolate the engine controls. It is not necessary to ISOLATE the shut down engine from its respective regulator locker.

5. Insert the master plug switch in the receptacle (located in the collision post at the controller) at either end of the car. Do not insert the reverser lever in the controller.

6. Snap the main lighting breaker and the main heat control breaker (located in the switch locker) to ON. Set both heat selector switches (located on the heat control panel) to HIGH or LOW. Set both fan control switches (baggage compartment) to THERMO.

Steam Anti-Freeze Protection When Being Towed in a Conventional Passenger Train with Both Engines Shut Down (no crew) (RDC-4)

1. Check that the hand valves ahead of the #9331 steam admission thermostat valves (located in the supply lines to each sump tank) are in the open position.

2. Check that the water level in both engine sump tanks is between the upper two try-cocks.

3. Check the heating control panel (located in the switch locker at the 'A' end of the car) to see that the main control breaker is ON and that both selector switches are on ANTI-FREEZE.

4. Check that the two fan control switches near the desk in the baggage compartment are on THERMO.

5. On the RDC-4, it is IMPORTANT that ALL hand operated shut-off valves in piping to ALL heating units are open to provide complete ANTI-FREEZE PROTECTION.

6. Turn off all lights in the car by tripping the master light switch.

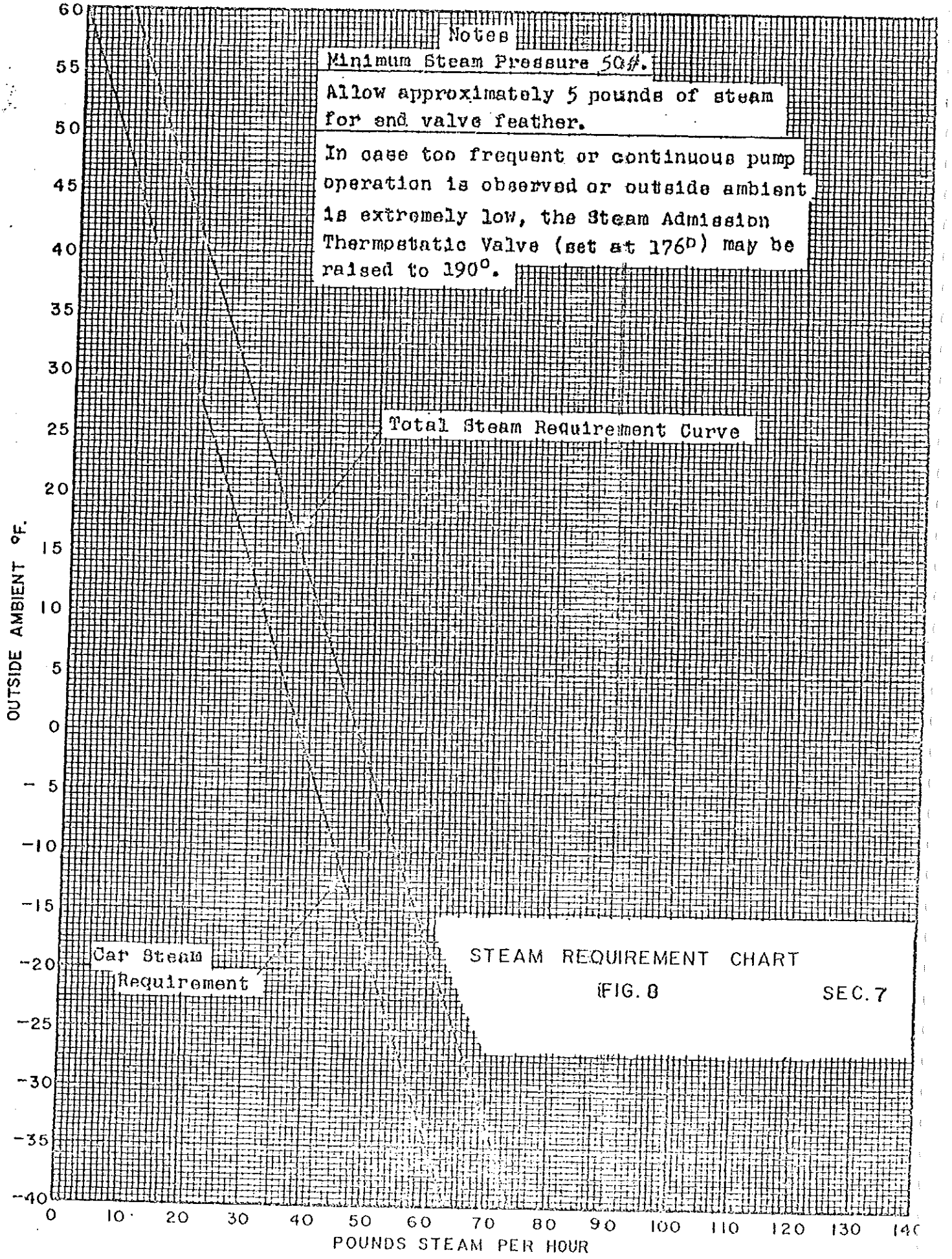
7. Check that both heat circulating pumps operate when car body temperature falls below 60°.

WARNING: If steam is not available, see Standby Protection Without Steam or Draining Instructions.

STEAM REQUIREMENTS FOR LAYOVER PROTECTION

The quantity of steam required for layover protection may be found on Figure 8.

If it is found that steam admission thermostat valve requires adjustment, refer to Adjustment Instructions, Figure 6.


Notes
Minimum Steam Pressure 50#.
Allow approximately 5 pounds of steam for end valve feather.
In case too frequent or continuous pump operation is observed or outside ambient is extremely low, the Steam Admission Thermpstatic Valve (set at 176D) may be raised to 190°.
Total Steam Requirement Curve
Car Steam Requirement
STEAM REQUIREMENT CHART
FIG. 8
SEC. 7
OUTSIDE AMBIENT °F.
60
55
50
45
40
35
30
25
20
15
10
5
0
- 5
-10
-15
-20
-25
-30
-35
-40
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
POUNDS STEAM PER HOUR

SECTION 8

ENGINE COOLING SYSTEMS

There are two identical cooling systems employed, one for each engine. They function independent of each other and are in no way connected.

The following covers the system for one engine only:

OPERATION OF THE COOLING SYSTEM

From the flow diagram Fig. 1, it will be seen that when the engine is first started and the water temperature is below 160°, the water is drawn from the engine cooling water tank by the engine water circulating pump, forced through the engine block to the water outlet manifold and returned to the engine cooling water tank without flowing through the roof radiators.

A temperature regulator, located on the end of the engine cooling water tank, is provided to control the water flow.

When water temperature is below 160°, water flow, through slots in the regulator housing, by-passes the radiators.

As water temperature rises, these slots are closed off by a cylinder actuated by an expanding thermal element. Close off is complete at 180°.

With slots closed off, water is forced up and through the overhead cooling radiators, returning to the engine cooling water tank.

Due to the cooling effect of the radiators, the water will first leave the engine at a lower temperature. However, as the radiators warm up, the outlet water temperature will gradually rise. When temperature reaches 165°, the contact of the low speed fan thermostat closes. This energizes the proper contactors on the fan control panel and the fan will operate at low speed. Airflow through the radiator cools the water, thus reducing the radiator outlet temperature. When the outlet water temperature drops to 157-159° the contact of the low speed fan thermostat opens and fan stops. The radiator water outlet temperature will then start to rise again until it reaches 165°, when the fan will again operate.

If the outside air temperature is such that fan low speed operation does not provide sufficient cooling, the radiator water outlet temperature will continue to rise above 165°. When temperature reaches 176°, the contact of the hi-speed fan thermostat will close and fan will operate at high speed. With fan operation at high speed the radiator water outlet temperature will drop until it reaches 168-170°. The contact of the hi-speed fan thermostat will then open and the fan will return to

low speed. This cycle will continue as long as the outside temperature remains high and the engine is delivering full output.

If for any reason, the low speed fan thermostat fails to start the fan, when radiator water outlet temperature reaches 176°, the hi-speed thermostat contacts will close. Fan will then start and operate at high speed.

From the above it will be seen that once the water outlet temperature of the engine exceeds 160°, water will flow through the radiators and the fans will start and stop, depending on the temperature of the water leaving the radiator. This on and off operation will continue as long as the engine is delivering power. If the outside temperature is low and the engine is idling, the heat dissipation of the engine may be less than that of the radiator. In this case, the engine outlet water temperature will drop and temperature regulator will open permitting the water to again flow to cooling water tank rather than to the radiator. All the water will then drain back into the tank and flow will be as shown in Figure 1.

The various units of the cooling system are as follows:

1. Engine cooling water tank.

   The engine cooling water tank is a 75 gallon stainless steel tank, 22 inches in diameter and 50 inches long. The tank is provided with a fill spud and a vent or overflow pipe.

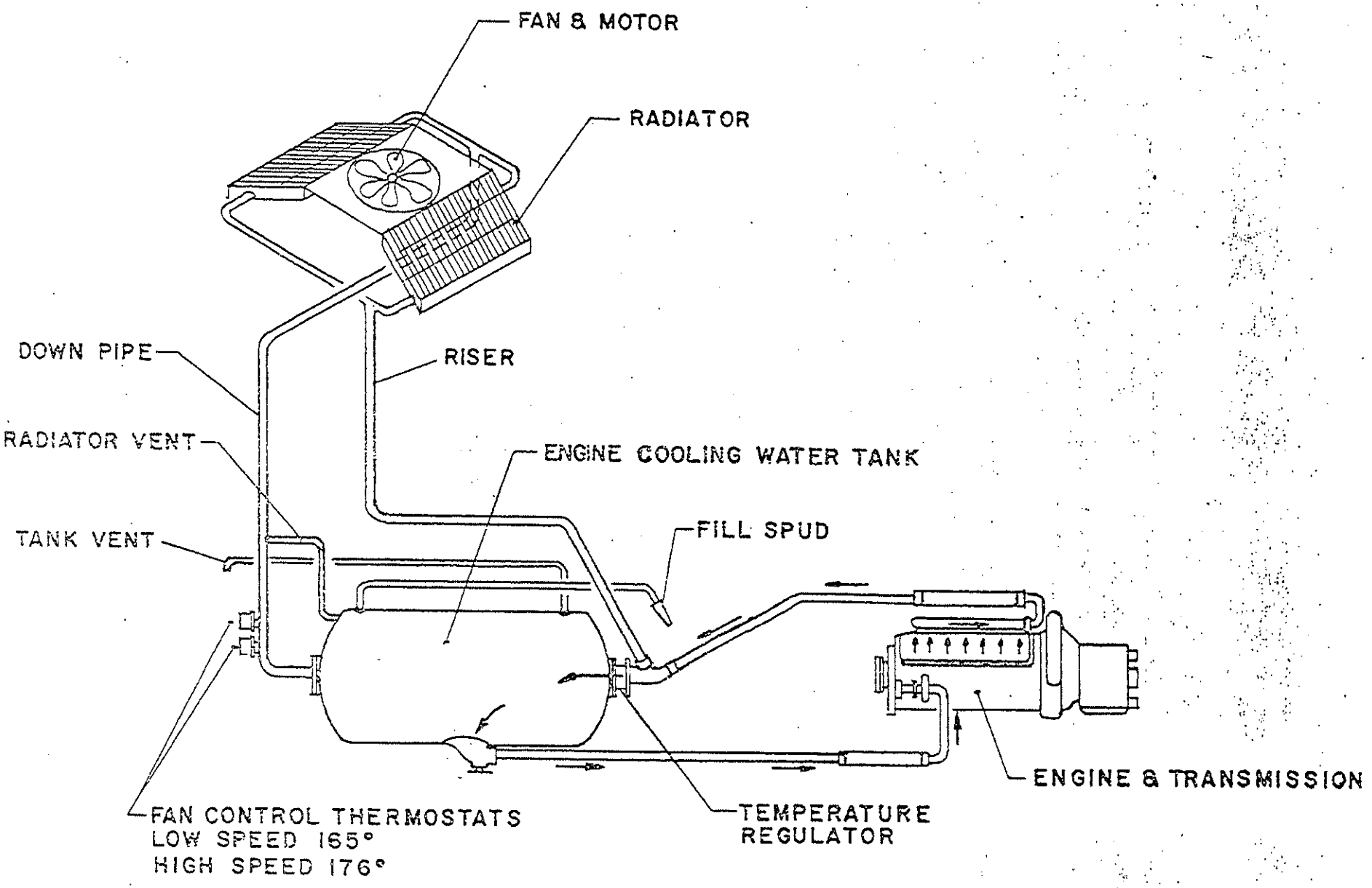
   A pipe connection is made between the vent pipe and the down pipe between the radiator and engine cooling water tank. This connection serves to break the vacuum in the radiators, allowing the water to drain out when they are not used for cooling purposes.

2. Engine Water Circulating Pump

   The circulating pump is a centrifugal type attached to and driven by the engine. This pump delivers 140 gallons per minute at an engine speed of 1800 r.p.m.

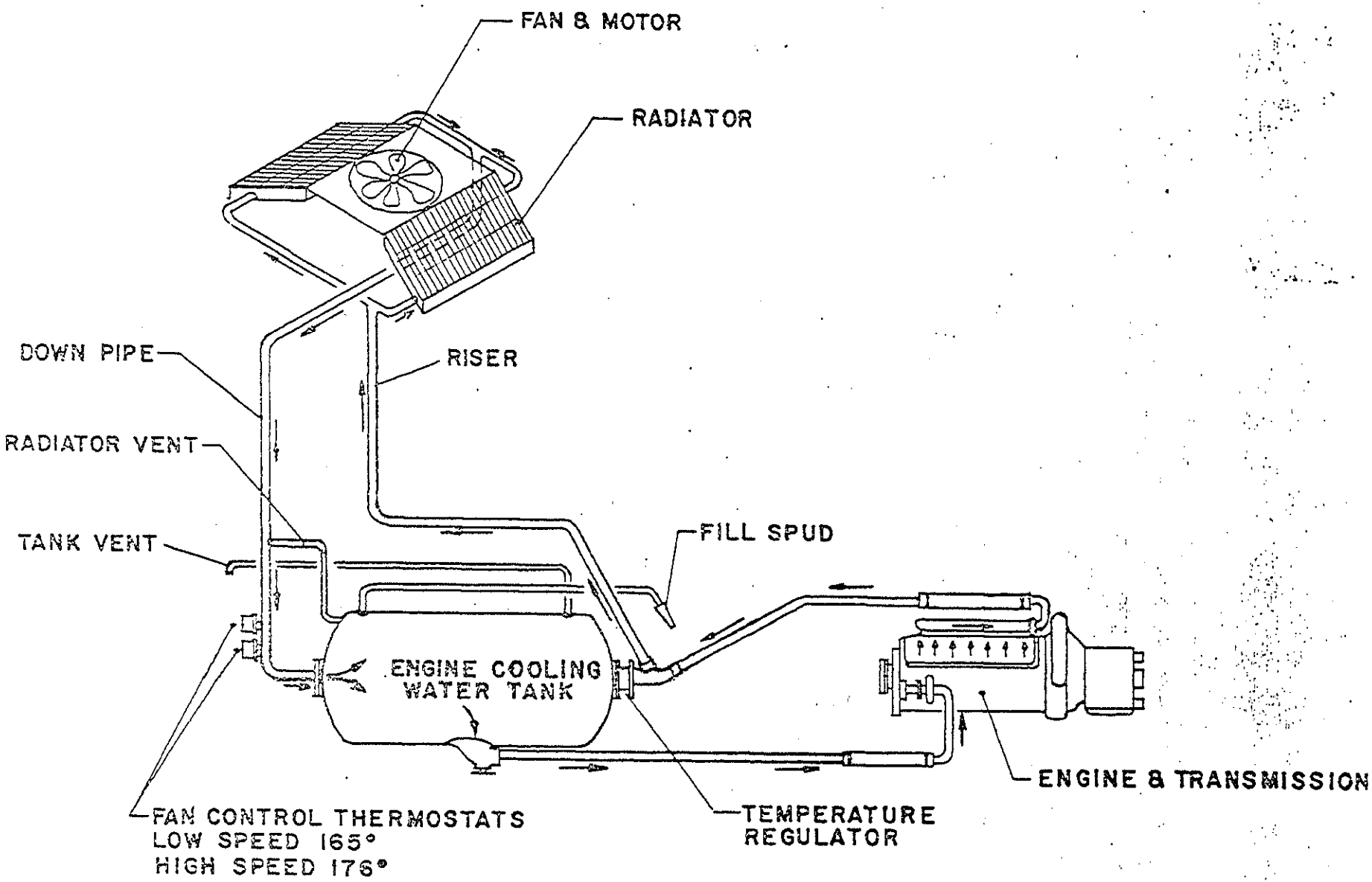
3. Radiators

   There are two radiators provided for each engine, mounted on rubber pads and set into a box-like enclosure or dome built on top of the roof sheets near the centerline of the car. Each radiator is approximately 36" x 69", 7" thick and is horizontal copper tube construction with vertical fins. The radiators are connected in parallel with the water entering one lower corner and leaving by the upper corner at the opposite end.



ENGINE COOLING SYSTEM
TEMPERATURE REGULATOR OPEN

FIGURE 1
SECTION 8



ENGINE COOLING SYSTEM
TEMPERATURE REGULATOR CLOSED

FIGURE 2
SECTION 8

a. Cleaning

The excess dirt should be removed from the fins and outside area of the core. The header and gasket surfaces should be cleaned with a wire brush. The core should be immersed in a hot (180° to 200° F.) alkaline cleaning solution. The cleaning solution either must be air agitated or one header plate should be applied to the core and the cleaning solution forced through the core. All external and internal surfaces must be clean. When the radiators are clean, they should be immersed in a tank of clean water or flushed with a hot water hose to remove the remaining residue and cleaning solution.

b. Testing

The radiators may be tested as an assembly or as individual cores. To test an assembly, attach the end tanks and bolt the tank and core assemblies together. Block the coolant outlet, immerse in water, and apply 25 p.s.i. air pressure at the coolant inlet. Allow sufficient time for the air pressure to become equalized. Determine the location of any leaks by observation of the escaping air bubbles.

Single cores may be tested in the same manner. Attach the end tanks, block the outlet, and apply 25 p.s.i. air pressure at the inlet. Mark any leaking areas of a header, or any leaking tubes, with crayon. A header leak is indicated by escaping air bubbles at the point where the tubes and header join.

c. Repair

To repair a header leak, clean the leaking area with flux, heat carefully with a gas torch, and flow soft solder over the leaking area. To repair a tube leak, block both ends of the tube with a small amount of soft solder. No more than four adjacent tubes may be repaired, nor may the total number of tubes repaired exceed 5% of the total number of tubes in the core.

After soldering, wash off all flux with clean water and repeat test.

d. Inspection

Check the frame for loose side channels. Straighten bent header flanges and fins. Clean covers and gasket surfaces before re-assembly and replace all old gaskets.

4. Temperature Regulator

The temperature regulator is bolted to the flange on the end of the engine cooling water tank.

The regulator consists of a cast housing with sliding cylinder actuated by an expanding thermal element.

When water temperature is below 160°, water flow, through slots in the regulator housing, by-passes the radiators. As water temperature rises, these slots are closed off by the cylinder. Close off is complete at 180°.

The only maintenance required is an occasional changeout of the thermal element. Normal service life of the element is at least 5 years.

5. Engine Cooling Water Hoses

These hoses are located as follows:

a. Inlet to and outlet from engine.
b. Cooling water lines to and from the radiators.

In an effort to eliminate serious difficulties due to deteriorated hoses, it is recommended that a routine inspection of all cooling water hoses be made on a six month basis.

Inspection - External and internal inspection should be made and if excessive deterioration is found, hoses should be replaced.

6. Electrical Equipment

The electrical equipment of the engine cooling system consists of the following:

a. Overhead Radiator Cooling Fan and Motor

Each pair of radiators is provided with a 36 inch multiblade fan directly connected to a 5 H.P. series motor. The fan and motor are mounted vertically between the two radiators; the fan draws air through the radiator, discharging it upward on the center-line of the car. The motor delivers 2-1/2 H.P. when operating at a low speed of 1440 r.p.m. and 5 H.P. at high speed when operating with weakened field at 1835 r.p.m.

Maintenance - Once a month or more frequently if found necessary, remove carbon dust from the motor coils and air passages of the armature. Brushes and commutator should be inspected at this time for any unusual wear conditions. Brushes must be free in

the holders and pigtail shunt connections tight. Worn brushes must be replaced when limit of wear is reached (1 inch). Wipe off all oil or grease from the commutator with a cloth.

Lubrication

The motor bearings are factory lubricated and sealed and do not require any additional lubrication for the life of the bearing. Lack of lubrication or wear indicates the need for replacement of the bearings.

b. Cooling Fan Thermostats (Refer to Figures 1 & 2)

Two immersion type thermostats are provided in the down pipe (return from radiators) and located underfloor near the engine cooling water tank. These thermostats control the 'on' and 'off' cycle as well as the high and low speed of the overhead radiator cooling fan motor. The settings of these thermostats are as follows:

1. The low-fan speed thermostat is set to close at 165° and open at 157-159°.

2. The high-fan speed thermostat is set to close at 176° and open at 168-170°.

c. Cooling Fan Control Panel

The control panel is located in the No. 2 ('A') end regulator locker. The following units are mounted on the panel:

1. Line Contactor with one normally open main contact, one normally open and one normally closed interlock.

2. High speed contactor with one normally open main contact, one normally open and one normally closed interlock.

3. Time delay relay with one normally closed main contact and one normally open interlock. This relay is set to hesitate for 1-1/2 seconds after the coil has been de-energized. After the 1-1/2 seconds, the armature will drop out and close the main control and open the interlock.

4. Engine cooling fan motor circuit breaker

5. Fan thermostat and contactor coil circuit breaker

6. Thermostat terminal block

d. Damper Switch

The damper switch is located on the engine and is connected to the

combustion air damper in such a way that if the damper is closed, the switch contacts are open. When the engine is running, the damper must be open and the switch contacts closed.

e. Engine Cooling Fan Motor Resistor - located at the top of the No. 2 ('A') end of regulator locker.

Operation of Electrical Equipment (Refer to Schematic Wiring Diagram).

In the following, it is assumed that the engine under consideration is running and the damper switch is closed.

As the water flows through the radiators, it is cooled somewhat by natural aspiration. However, if the cooling rate is insufficient, the temperature of the water leaving the radiator will rise. When it reaches a temperature of 165°, the contact is made, battery current will flow from B + through the 5 amp. control circuit breaker, wire BP1, wire HC1, the low speed fan thermostat, wire LC3, the coil of the time delay relay, M1 interlock, wire 8F1, the engine damper switch to B-. At the same time, battery current flows through jumper from terminal #5 (B+) to one side of M1 contactor coil.

When the time delay relay coil becomes energized, the TD interlock in the M1 contactor coil circuit closes and completes the circuit to 8F1 (B-). This energizes the M1 contactor coil, closing the M1 interlock and sealing the M1 contactor closed. At the same time, the M1 interlock in the TD relay coil circuit opens and the coil de-energizes after 1-1/2 seconds.

When the M1 contactor closes, a circuit is completed from B-, through wire CR1 to A2 of the fan motor. When the TD interlock closes in the M1 contactor coil circuit, the TD contact opens in the B circuit to the fan motor. This places the start resistance in series with the motor so that the motor starts on reduced voltage and reduced speed. After 1-1/2 seconds, the de-energizing of the time delay coil closes the contact across the start resistance and places the full battery voltage across the motor. The 1-1/2 seconds is sufficient time for the fan motor to have reached a speed where the application of full battery voltage will not produce a notifeable voltage drop.

When the fan starts, it cools the water flowing through the radiator. When the water temperature reaches 157-159°, the contact of the low speed fan thermostat will open. This de-energizes the coil of M1 contactor, permitting M1 contacts to open and stop the fan motor. At the same time, interlock M1 closes and re-establishes the circuit to the time delay relay for subsequent starting.

However, if the low fan speed is insufficient to cool the water in the radiator and the temperature continues to rise, when it reaches 176° the contact of the high speed fan thermostat closes.

This causes battery current to flow from B + through the 5 amp. control circuit breaker, wire BF1, wire HC1, the 176° high speed thermostat, wire HC3, the coil of M2 contactor, wire 8F1, the engine damper switch to B-. This energizes the M2 contactor coil, closes the M2 interlock shunting the 165° thermostat, closes the M2 contactor which connects the shunt resistance in parallel with the series field coils of the fan motor, weakening the field and increasing the speed of the motor and fan.

The increased speed forces additional air through the radiator, providing increased cooling of the water and lowering the outlet water temperature. When this temperature drops to 168-170°, the contact of the high speed fan thermostat opens. This de-energizes the coil of the M2 contactor allowing M2 contacts to open cutting out the shunt resistor and restoring full field to the motor. The motor then slows down to low speed.

Under normal high speed fan operation, the closing of the M2 interlock across the 165° thermostat has no effect since the 165° low speed thermostat contacts would be closed and the motor running. However, if the 165° thermostat should fail to close and prevent the starting of the fan at low speed, then when the water out of the radiators reaches a temperature of 176° and the contact of the high speed thermostat closes, the starting circuit would be set up the same as if the 165° low speed fan thermostat had closed. This is an emergency condition. Closing of the M2 contact will increase the starting resistance and at the same time weaken the motor field, thus allowing the motor to start at a higher acceleration rate.

It is important that a periodic check of the 165° thermostat be made in order to insure its operation at all times. A continued use of the high speed thermostat without the low speed thermostat first closing imposes an extra load on the fan motor and will ultimately shorten the life of the motor.

MAINTENANCE

All contacts of the contactors must be inspected periodically, the burrs removed and contacting surfaces maintained smooth. The interlocks must be checked for proper contact.

Engine Cooling Fan Control Test

1. Check to see that the handbrake is properly set.

2. Start both engines and charge the air brake system. When full charged, make a full service reduction. It is important that the brakes remain applied, as this test will be made with transmission clutches engaged.

3. Make test on one engine at a time with the second engine isolated.

4. On the cooling fan control panel of the engine being tested, move the engine cooling fan motor circuit breaker to OFF position. Allow the thermostat circuit breaker to remain in the ON position. Place the controller reverser handle in the forward or reverse position. Advance the throttle to No. 1 position. Wait for the transmission clutch to engage, then advance throttle to No. 2 position. The engine should be running for a sufficient length of time to allow the engine cooling water temperature to reach 160°, diverting the water to the cooling radiators.

   As the temperature of the water in the engine increases to approximately 172°, the 165° fan control thermostat will close the low speed fan contactor. As the temperature of the water continues to rise, and reaches 182°, the 176° fan control thermostat will close the high speed fan contactor.

   Place the throttle in OFF position. Return the cooling fan motor circuit breaker to the ON position. The fan motor will then operate at high speed until the temperature of the water falls below 176° at which time the high speed contactor will open, reducing the motor speed to low. The motor will continue to operate at low speed until the water temperature drops to approximately 165°. The low speed contactor will then open, shutting off the fan motor.

5. Repeat this test for the second engine cooling fan control.

Filling the Engine Cooling System

The sump tank is provided with three try-cocks to indicate the level of the water. Care should be taken when replenishing the water not to overfill the tank. When the temperature regulator closes, approximately 15 gallons of water is drawn from the sump tank and forced into the radiators on the roof. This will lower the level of the water in the sump tank.

When checking the level of the water in the sump tank, first shut down the engine. With the engine shut down:-

Top cock-water should not be above this level (FULL)

Middle cock-water should flow (NORMAL)

Bottom cock-water flowing from this cock only is a signal to add water (LOW). If it is necessary to add water, open the top cock and fill until water flows. Any further filling is only a waste of the chemical treatment in the water.

If, for any reason, the engine cooling system has been drained and it is necessary to refill, there are four steps that must be followed:-

a. Fill the sump tank to overflowing.

b. Start the engine and run long enough to purge all air in the engine block and piping.

c. Start the car heat pumps by removing the floor heat thermostat from its base and positioning the selector switch, of the heating and cooling panel, to "anti-freeze". This will cause both floor heat and overhead heat pumps to operate. Allow pumps to operate until radiators and coils are hot. This should purge all air from the heating system pipes and heater units.

If the above procedure does not purge the air from the system, the radiators and coils do not get hot, then the drain cocks at the end of each run of radiation amd the vent cock at the top of the overhead heat coil must be opened. With both pumps operating, open one cock at a time until hot water under pressure runs from the cock.

NOTE:
Wooden plugs are applied to the drain holes at each drain cock to prevent the entrance of dust. These plugs must be re-applied after venting has been completed. (For location of vent and drain cocks see water draining instructions Section 23).

d. Refill the sump tank to the top try-cock level.

Inhibitor

It is recommended that some type of inhibitor be used in the cooling water. The type used will depend on the water used and the standard practice of the Railroad on which the cars are operating. It is suggested that each Railroad use the same treatment as used in their Diesel locomtives. In the absence of any specified Diesel locomotive water treatment, the following is recommended by the engine manufacturer:

1. Maintain 1 ounce of sodium chromate per 35 gallons of water.

2. Adjust the PH value to between 8.5 and 9.5.

3. Analyze the water at least once a week.

Since the system contains 85 gallons of water (with a full sump tank, 2½ ounces of sodium chromate should be added every time the system is drained and refilled.

A removable plug has been provided for the easy insertion of water treatment powder, pellets or liquid. This plug is located in the outlet line from the radiators.

Since the steam used on standby anti-freeze protection is injected into the engine cooling water, there will be considerable dilution of the inhibitor solution during the winter time. Therefore, more frequent check of the concentration of the inhibitor is required in winter.

Engine Draining Instructions

A master drain plug is provided in the sump tank bottom fitting. This plug is provided with a cross bar for easy removal. Tapping on the cross bar with a hammer will loosen the plug so that it can be removed by hand. A small fitting is provided in the bottom of the engine water pump for draining. Since the oil coolers on the engine have a low sump, a valve is provided for draining. The extension handle of this drain valve is located on the lower part of the engine to the left of the water pump. (For location of drains see water draining instructions Section 23).

Anti-Freeze Protection

The design of this system is such that it is not necessary to use anti-freeze solution in the cooling water. As long as the engines are running, all associated piping is at a safe temperature.

However, if an engine should stop en route and cannot be re-started and the ambient temperature is such that there is danger of freezing before the next scheduled stop is reached, the cooling system should be drained (See Engine Draining Instructions this section).

Anti-freeze protection by means of steam is provided for yard parking with the engines shut down. A steam trainline is provided with standard end connections. Steam from this trainline is injected into the sump tank of each engine to maintain the water at normal engine temperature. The operation of this standby system is explained in Section 7 under "Heating".

SECTION 8

SUPPLEMENT 1

STANDBY ANTI-FREEZE PROTECTION

Anti-freeze protection for the engine cooling water on the Reading Company RDC-1's is provided by 18 KW immersion heaters (Edwin L. Weigand Co. Chromalox, Cat. #TM-3183) mounted in the head of each cooling water sump tank.

Immersion thermostats, set to maintain water temperature of 176°, are provided in the water return line adjacent to tank.

A control box, containing the following equipment, is mounted under the floor adjacent to the battery box.

STANDBY RECEPTACLE - for connection to 220 Volts AC standby service. Pyle-National Cat. #KZCFB-57542-RA.

A similar receptacle is mounted on opposite side of the car.

PILOT LIGHTS - Two pilot lights (Dialco #121-606-1231) are mounted under the receptacle to show immersion heaters ON. Neon Glow Lamps NE-48 with double contact bayonet base are used.

STARTING SWITCHES - Two across the line starting switches (100 amp, 3 phase, Allen-Bradley Bulletin 709, Form 2, size 3).

FUSES - Three 10 amp. cartridge fuses.

Immersion heater wiring is as shown on Budd drawing T87-64727.

WARNING - Check engine cooling water tank water level before connecting to A.C. supply.

When water is drained, fuse for that contactor must be removed.

SECTION 9

AIR CONDITIONING SYSTEM (COOLING)

FOR RDC-1, 2 AND 3 ONLY

"Safety" Electro-Mechanical Air Conditioning Equipment is comprised of the following:

1. Air Conditioning Unit
2. Motor-Compressor Unit
3. Condenser Unit
4. Heat Exchanger
5. Liquid Filter-Drier
6. Liquid Line Filter
7. Motor Control Panel

The relative location of parts for the complete system is as shown in Figure 1. A description of each unit follows:

AIR CONDITIONING UNIT

This unit is mounted over the ceiling in the 'B' end of car. It is comprised of a fan and motor assembly, evaporator, heating coil, expansion valves and drip pan.

The fans draw a mixture of air from the car and fresh air from the outside and discharge it through the heating coil and evaporator where it is cooled and de-humidified or heated and then discharged to the car. The drip pan collects the moisture which is condensed on the evaporator and from there is piped to undercar. The cooling coil is divided into two sections, each supplied with refrigerant by its own expansion valve. This arrangement permits operation at approximately one-half capacity when the cooling load is light.

The blower is a standard unit with variable speed motor, 1200-2000 r.p.m., .875 - 1.5 H.P., 75 V.DC. This unit is capable of delivering 2400 cfm through the coils into the main air duct.

A resistor, located in a box on the motor casing is connected in series with the armature of the motor to permit speed adjustment. This resistor is adjusted to provide the following air delivery:

RDC-1	2400 cfm
RDC-2	2100 cfm
RDC-3	1800 cfm

The cooling coil is supported by a set of slide rails mounted to the roof structure (see Figure 1). The front end of the unit is driven

under a wedge and held in place by two bolts attaching the unit to the rails, one on each side.

To remove the cooling coil, first remove the blower unit. Only the two bolts attaching the coil to the rail need be removed and the unit can be slid toward the end of the car. When above the vestibule ceiling trap door, the coil will slide off the rails and may be lowered through the trap door opening.

The blower unit is attached to the same set of rails that support the cooling coil with four bolts. Remove these bolts and lower through trap door opening.

MOTOR-COMPRESSOR UNIT

Included in this unit are the compressor, a 13.5 H.P., 1750 r.p.m. 75 V.DC motor, flexible coupling, compressor control box and supporting frame. The compressor is driven directly from the motor shaft through a flexible coupling. The compressor is mounted on the bracket which is bolted to the head of the motor. It is a four cylinder "V" type automatic unloading unit.

The controls are contained in a waterproof box attached to the side of the motor frame. Controls include high and low pressure gauges, a shut-off valve for each gauge and a dual pressure-stat having high and low pressure control switches. Also included is a switch for manually starting and stopping the equipment. The high pressure switch is set to cut out at 235 p.s.i. and cut in at 205 p.s.i.

The low pressure switch is set to cut out at 2-5 p.s.i. and cut in at 10-15 p.s.i.

CONDENSER UNIT

The condenser is an 8 ton capacity air cooled type consisting of a condenser coil, fan with variable speed motor, 1200-2000 r.p.m., .875 - 1.5 H.P., 75 V.D.C. liquid receiver and a pressure modulation switch mounted in waterproof box on the frame.

An adjustable resistor, used to vary the field of the condenser motor to obtain proper r.p.m., is mounted in a waterproof box on the motor frame.

HEAT EXCHANGER

The heat exchanger is located over the ceiling adjacent to the cooling coil. Access is through the 'B' end toilet ceiling trap door opening.

LIQUID FILTER-DRIER

This is a combination liquid filter and drier. It is used to prevent dirt from reaching the expansion valves and to remove moisture from the system.

THERMOSTATS

The thermostat containing two mercury tubes is located in the recirculated air stream just above and to the left of the recirculated air grille.

RETURN AIR GRILLE

The return air grille, 20-3/4" x 32-3/4", is mounted in the low ceiling under evaporator unit. A perforated plate, calibrated to produce the proper ratio of fresh and return air, is installed under the return air filter. This plate should not be removed or changed except after exhaustive tests prove that the fresh air - return air ratio is incorrect. These ratios as fixed when cars are built are as follows:

RDC	Fresh Air	Recirculated Air	Total
RDC-1	600	1800	2400
RDC-2	600	1500	2100
RDC-3	600	1200	1800

RETURN AIR FILTERS

Two 16" x 20" x 2" metallic viscose filters are mounted in the return air grille frame. Normally the cars are furnished with Air Maze type 'B'. However, the frame will accommodate any standard 16" x 20" x 2" unit. The filters can be removed for cleaning or replacement by lowering the return air grille.

FRESH AIR INTAKES

Two fresh air intakes, one on each side of the car, in roof above the letterboard. The two intakes are connected together by a 3" x 19" cross duct installed under the roof sheets between carlines. The cross duct in turn is connected to a freish air filter box located forward of, and to the left of, the cooling unit.

FRESH AIR FILTERS

One 16" x 20" x 4" metallic viscose filter is located in the plenum chamber just above and to one side of the recirculated air grille. Normally an Air Maze type P-18 is furnished, but the frame will accommodate any standard 16" x 20" x 4" unit.

EXHAUST OUTLETS

There are two exhaust outlets, in the roof, at each end of the car, located one on each side. These outlets are connected by a cross duct which is connected to the exhaust air grilles in the ceiling of each toilet.

Since only one toilet is provided in the RDC-2 and RDC-3, provision is made to exhaust a portion of the passanger compartment air into the baggage compartment through a grille in the partition between the two sections.

AIR DISTRIBUTION

Air from the cooling coil is forced through a 9" x 35" stainless steel main air duct located in the center of the car. There is a flexible connection between the duct and the outlet of the air conditioning unit. An opening with zipper closure is provided in the flexible duct for access to the face of coil. Air is distributed into the car through "Anemostats" installed in removable panels forming the lower side of the main air duct. Adjustable dampers in the anemostats are set when cars are built to provide proper air distribution into the car body. These dampers should not be changed as it may seriously affect the air distribution, with subsequent change in temperature levels.

To remove air duct lower panels, remove moulding along one side, attached with slotted head fasteners. When moulding is removed, the panel can be lowered and opposite side slid out from under the fixed moulding.

The alternate panels, with light fixtures, may also be removed in same manner. The wiring for light fixtures however must be first disconnected.

When removing the two similar panels at the exhaust duct location, the panel toward the #1 end of the car must be removed first.

MOTOR CONTROL PANEL

The motor control panel, located in the 'B' end regulator locker, contains the following equipment for compressor and condenser motor control:

L.C.	Line Contactor
A.C.	Accelerating Contactor
L.V.R.	Low Voltage Relay
T.D.U.	Time Delay Unit
S.R.	Starting Resistor
R.	Low Voltage Relay Resistor
R1.	Field Resistor

CONTROL SWITCH

The switch controlling the cooling system is mounted on the heating and cooling control panel in the lower part of the switch locker, 'B' end of car. The switch has 5 position: HI-HEAT, LO-HEAT, OFF, COOL and ANTI-FREEZE. When the switch is in the COOL position, the control circuits to start the system are energized providing the car temperature is above 72°. The blower switch located at the bottom of this panel must be in ON position and the main lighting circuit breaker must be ON before cooling can be obtained.

COOLING PILOT LIGHT

A clear glass pilot light is provided, located above the switch locker door on the 'B' end of car. The light is on only when the condenser and compressor are operating.

The lamp used is 6W, 105-115V., GE 636 DC or equal.

FUSES

The following fuses and circuit breakers are used in the cooling system:

Compressor - 225 amp fuse mounted on the motor control panel in 'B' end regulator locker.

Condenser - 30 amp fuse mounted on the motor control panel in 'B' end regulator locker.

Compressor Pilot Light - 5 amp plug fuse mounted on the motor control panel.

Blower - 30 amp circuit breaker on heating and cooling control panel in switch locker.

Positive Control - 5 amp circuit breaker on heating and cooling control panel in switch locker.

Negative Control - 5 amp circuit breaker on heating and cooling control panel in switch locker.

OPERATION OF SYSTEM

To obtain cooling, the main lighting circuit breaker must be ON. Turn the blower switch, at the bottom of the heating and cooling control panel to ON and cooling control switch to COOL.

If the car thermostat calls for cooling (above 72°) and one or both engines are running, the compressor and condenser motors will start. The cooling pilot light will be lighted when both are running.

Operation will continue, thus until the car temperature has lowered to the high thermostat setting (75°). With the automatic unloading compressor and single speed motor, the liquid magnet valve will then close and the compressor will automatically unload.

If the car temperature continues to fall to the setting of the low thermostat, the controls will function to stop operation. The overhead blower however will continue to operate to deliver air into the car body.

If the engines on the car are not running, push the reset button to start the unit. The unit may or may not start, however, depending on the charged condition of the battery. If it does start, it will operate for only a short time until battery voltage drops to a point where the low voltage relay will shut down the unit to protect the battery.

If one or both engines are running, and the generators are charging, the reset is automatic through the auxiliary contact on the reverse current relay.

OPERATION OF CONTROLS

Wiring schematics show the car schematic diagram for the cooling of the car. Operation is as follows:

The selector switch on the heating and cooling control panel in the switch locker should be turned to COOL. The blower switch on panel and the main lighting breaker must also be ON.

After the control switch is turned to the ON position, setting the blower fan in operation, the low voltage relay (LVR) is energized either through an interlock on the reverse current relay or by depressing the reset button. With the contacts of this relay closed, when the car thermostat demands cooling, the coil of the accelerating contactor (AC) is energized through a normally closed auxiliary contact on the line contactor (LC). The normally closed contacts of the accelerating contactor (AC) open, removing the short around the compressor motor starting resistor. At the same time the auxiliary contact on the accelerating contactor (AC) closes, energizing the coil of the line contactor (LC). The main contacts of the line contactor close, starting the compressor motor through the starting resistor (SR) and also starting the condenser fan motor.

The normally closed auxiliary contacts on the line contactor opens, de-energizing the accelerating contactor. After a delay of approximately 2 seconds, the accelerating contactor drops open, shorting the starting resistor (SR) and connecting the compressor motor directly to the line. The line contactor (LC) is held in closed position by the holding auxiliary contactor on the contactor. The compressor motor and condenser fan motor will continue to run until:-

a. the cooling thermostat is satisfied, or

b. the voltage drops below value for which the low voltage relay (LVR) is set, or

c. either the high pressure or low pressure cut-out switches operate, or

d. compressor motor fuse opens.

SERVICING AND MAINTENANCE

a. Filters

The fresh air and recirculated air filters should be removed and cleaned weekly to guarantee proper air distribution. To remove filters, lower the recirculated air grille in low ceiling area, 'B' end of car. The recirculated air grilles are mounted in this grille. The fresh air filter is located in a frame above and to one side of the recirculated air grille.

The filters should be removed, steamed, washed clean, dipped in oil and drained according to standard practice. On some Railroads it is the practice to spray with oil rather than dipping.

b. Cooling Coil and Blowers

The cooling coil and blowers should be blown out with compressed air every 6 months. The flexible connection between the coil and main discharge duct is provided with a zippered opening in the lower portion to permit access to the coil face. The flexible connection between the blower and coil is attached by means of a ring held in place with wing nuts. After loosening the wing nuts the ring can be pulled down and out of the top slot, and pushed against the blower to gain access to the coil face.

c. Safety Equipment

Detailed information pertaining to service and maintenance of the air conditioning equipment is covered in Safety Industries' Operating Instructions and Service Manual Forms 4229A-55 and 4993-5-58.

PROCEDURE FOR COOLING RDC WHEN BEING TOWED IN A CONVENTIONAL PASSENGER TRAIN -

1. One engine must be operating to provide battery charging. The engine stop and isolation switch (located in the respective regulator locker) must be in ISOLATE position to isolate the engine controls. It is not necessary to isolate the shutdown engine from its respective regulator locker.

2. Place the main lighting breaker and the blower switch in ON position. Set the selector switch on the heating and cooling control panel on COOL position.

   CAUTION - If abnormal loads are encountered due to operating conditions, the second engine may be required.

   If second engine is required, item #1 should be repeated for this engine.

UNIT HEATER AND VENTILATING FANS - RDC-3 and RDC-4

Lubrication, if required, should be as recommended per Budd Lubrication and Fuel Specifications.

Unit heater coils should be blown out with compressed air as often as necessary to keep the coils clean.

Carbon dust and dirt should be blown out of motors and brushes inspected for abnormal wear on a monthly basis.

SECTION 10

ELECTRICAL LIGHTING SYSTEM

(For lighting outlets and circuits, see Wiring Schematics).

The car receives current for lighting from the battery. The current first passes through a 70 ampere De-ion no fuse circuit breaker and then to a lamp regulator where it is regulated to 62 volts.

Circuit breakers, located in the switch locker at the #1 (B) end of the car, protect the lighting circuits described below.

On the RDC-1, 2 and 3, three 15 ampere circuit breakers protect the fluorescent ceiling lights and cove lights in the passenger compartment.

A 20 ampere circuit breaker protects the following circuits - number signs, gauge, speedometer and classification lights, headlights, vestibule, and toilet lights. Each of these lights is provided with an individual switch in the operator's cab with the exception of the toilet lights which are lighted whenever the circuit breaker is in the ON position.

On the RDC-1, 2, and 3, a double pole, 20 ampere circuit breaker, protects lights in the regulator lockers and plenum areas, receptacles for a trouble light in each engine casing, and defrosters for operator's windshield.

The ceiling, cove lights and number lights are fluorescent and require 14W - 3500° white 15 inch tubes which are arranged to operate on 62 volt DC. These lights also require an FS-44 starter, a 10V 0.40 A ballast lamp and a choke ballast. See Fig. 1 for wiring arrangements.

The toilet, plenum and classification light fixtures require a 25 watt, 60 volt incandescent lamp in each.

The vestibule ceiling fixtures require a 40 watt, 60 volt lamp in each.

The gauge and speedometer lights use a #44 6-8 volt .25 ampere miniature bayonet base lamp.

The regulator locker lights require 15 watt, 60 volt lamps. These lights are controlled by door operated switches.

The headlight unit consists of two sealed beam lamps set in recesses at each end of the car. The lamps are adjustable to control the light beam vertically and horizontally and are removable through the vestibule ceiling trap door. Each lamp is a GE Par 56 rated at 200 watts, 30 volts (two are operated in series on 62 volts providing full output). A resistor in series is provided for dimming.

A resistor is also provided for emergency lighting of the headlight in case of a filament failure in one of the lamps. Placing the emergency switch in ON position connects the good lamp in series with this resistor, allowing the good lamp to light (See Fig. 2).

In the event of a lamp failure, this procedure MUST BE FOLLOWED;-

1. Position headlight control switch in either DIM or BRIGHT position, depending upon requirement.

2. Place the emergency switch in ON position.

This switch is provided with two ON positions, one position for each lamp. The ON position that will light the good lamp must be determined by trial.

A stainless steel guard is placed over the emergency switch to avoid accidentally placing this switch to ON position when no lamp failure exists. The normal position for this switch is OFF.

Car number signs are located in the cab end sheet above the windshields at both ends of the car. They are illuminated by the 14 watt fluorescent lamps previously mentioned.

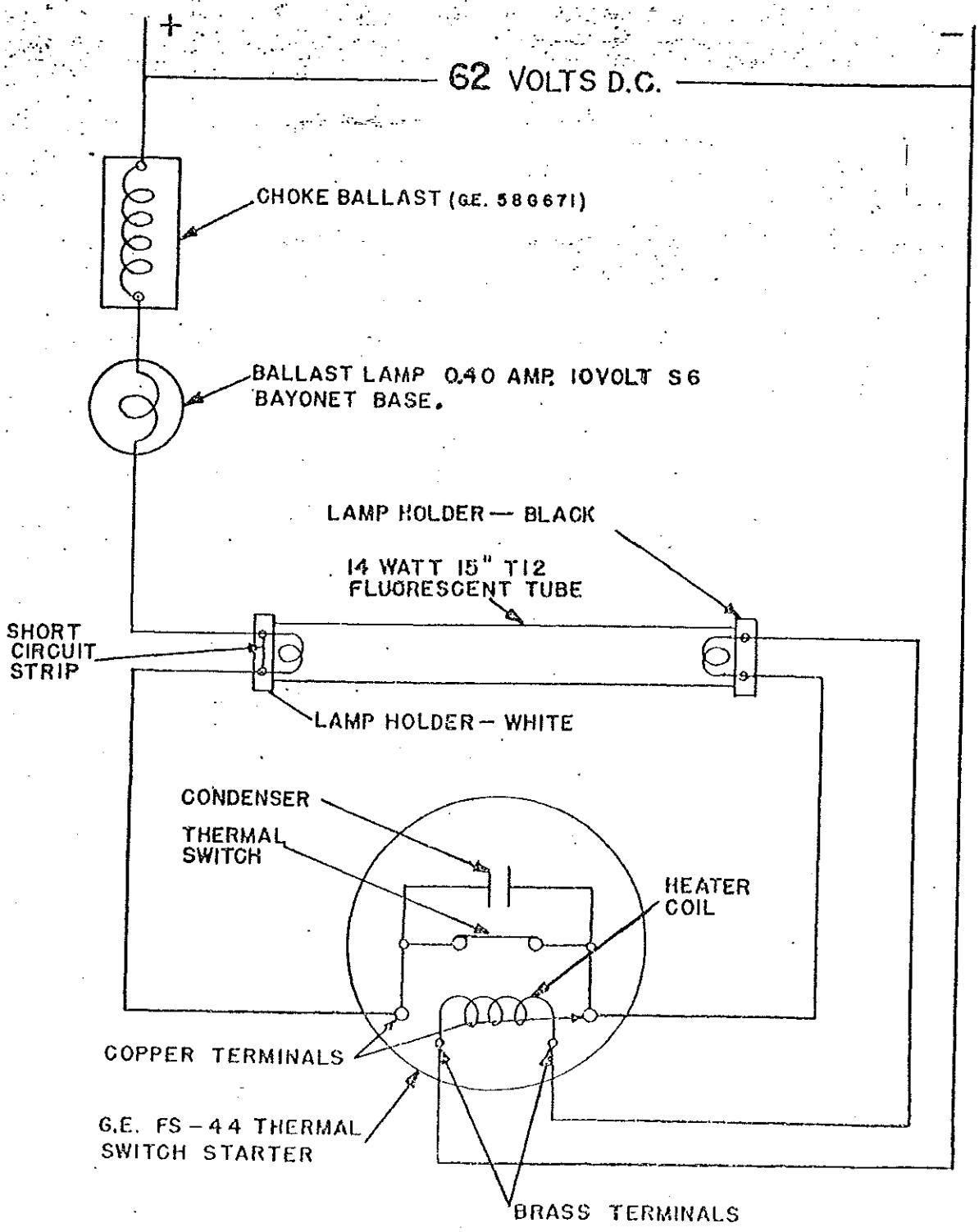
Five-inch numbers are provided on the glass face. A hinged panel in the operator's cab provides access to the lamp and accessories for servicing.

Classification lights are provided, four per car, and are located in the upper corners of the cab end sheet. They are provided with watertight clear lenses for visibility from the side and ahead. Provisions are made for showing amber, red, green and white by the turning of the colored glass holder so that the color selected is between the light bulb and the clear lens. As previously mentioned, these lights are equipped with 25 watt - 60 volt lamps.

The generator pilot lights have green lenses, one for each generator and are located on the panel over the windshield at the operator's position at each end of the car. They are labeled "Gen. #1" for the generator on the 'B' end of the car and "Gen. #2" for the generator on the 'A' end of the car. These lights indicate if the generators are charging and that the respective engine which drives the generator is running. These pilot lights are equipped with 6 watt, 115 volt GE-S6 candelabra base bulbs.

The air conditioning compressor pilot light has a white lens and is located over the switch locker door. This light indicates when the compressor is in operation. This light requires a 6 watt, 115 volt GE-S6 candelabra base bulb.

A 64 volt receptacle is provided in each engine box for use of a trouble light.

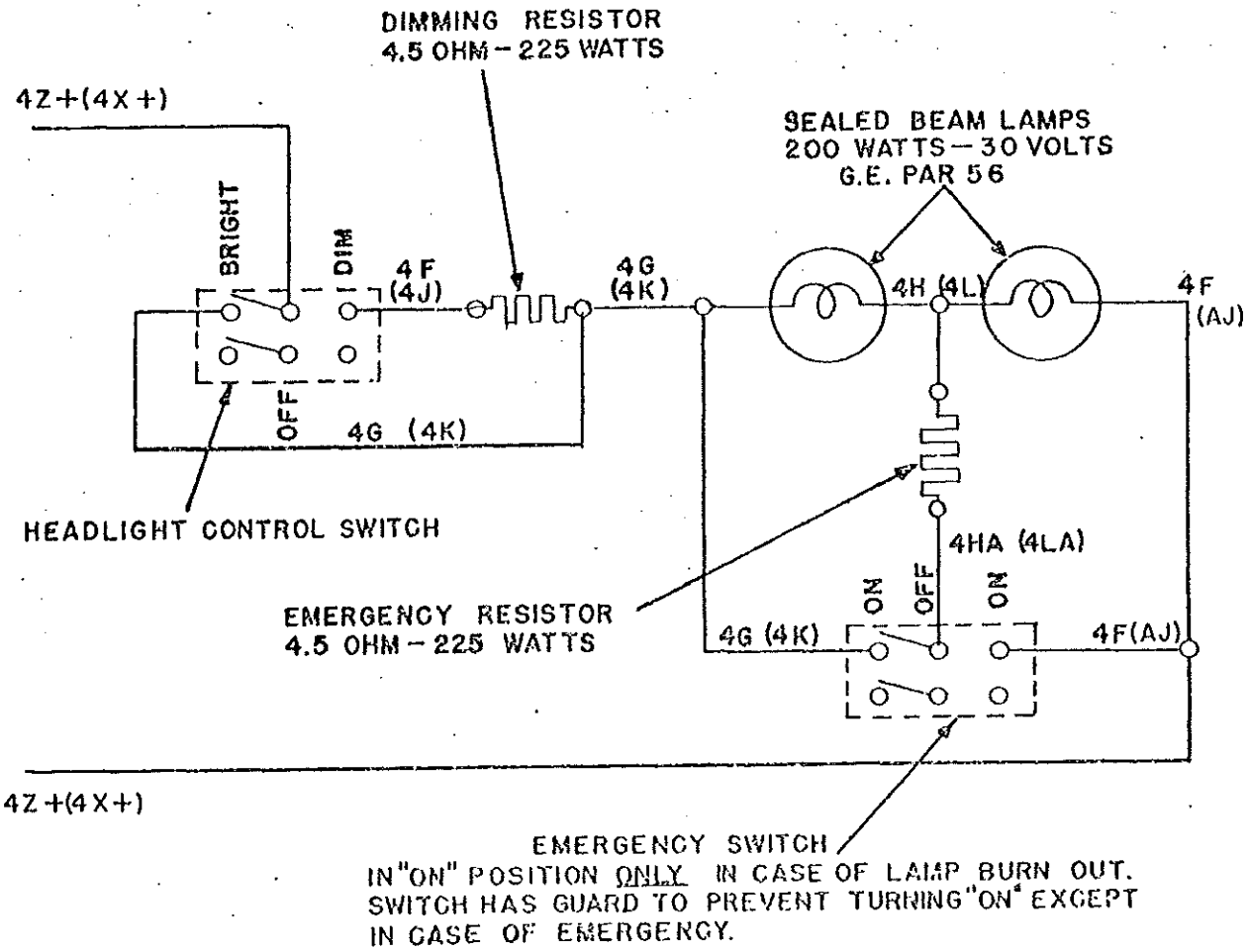


FLUORESCENT LAMP WIRING

FIG. 1

FIG. 1
SEC. 10

NOTE: WIRE DESIGNATIONS IN PARENTHESIS ARE FOR "A" END OF CAR-OTHERS ARE FOR "B" END OF CAR



HEADLIGHT CIRCUIT

FIG. 2

SECTION 10

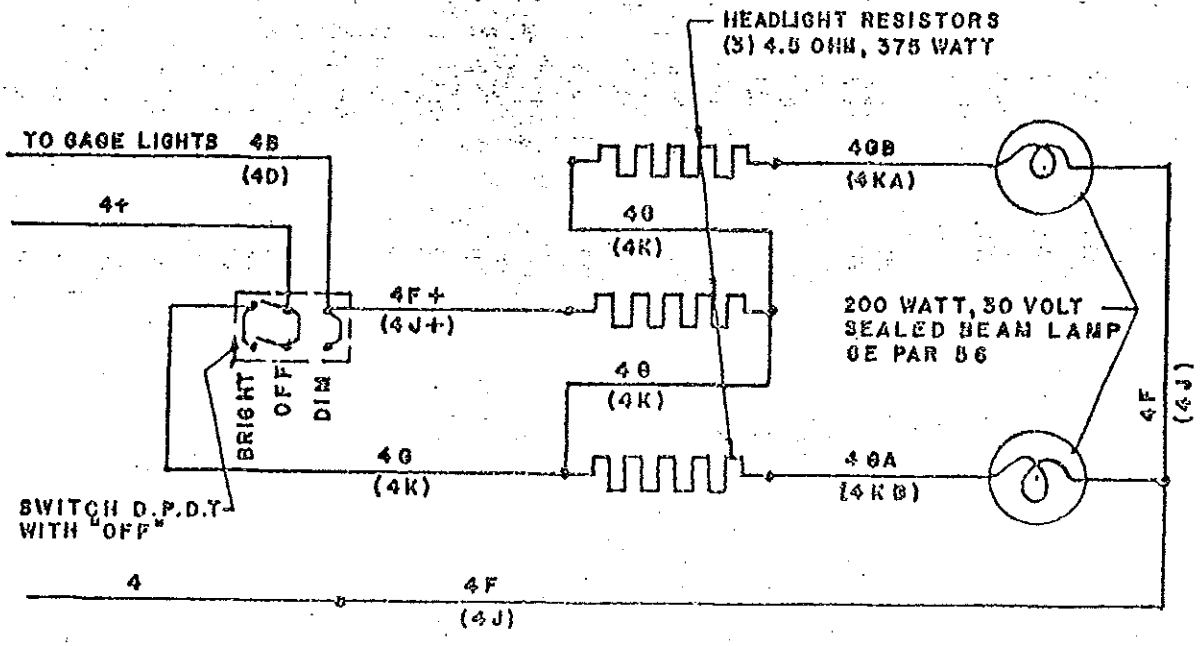
SUPPLEMENT 1

Headlight wiring on the Reading Company RDC-1's differs from the basic RDC as follows:

Two GE Par 56 lamps, rated at 200 watts, 30 volts are provided at each end of car and operate on reduced voltage thru 4.5 ohm, 375 watt resistors.

An additional 4.5 ohm, 375 watt resistor is provided for dimming.

Refer to schematic wiring below.



NOTE. WIRE DESIGNATIONS AS SHOWN ARE FOR 'B' END. THOSE IN PARENTHESIS ARE FOR 'A' END.

HEADLIGHT SCHEMATIC

READING CO.

RDC-1

Marker light brackets are supplied at the corner posts for the mounting of signal oil lamps or a signal flag.

In the baggage section of the RDC-2 and 3, two 50 watt, 60 volt incandescent lamps are provided on the ceiling and are controlled by fixed switches located on a bulkhead in the baggage section.

Each baggage door is provided with a 25 watt, 60 volt incandescent lamp controlled by individual fixed switches mounted on the light fixture.

In the RPO section of the RDC-3, four 50 watt, 60 volt incandescent lamps are provided on the ceiling and are controlled by a fixed switch located on the end of the paper box on the left hand side of the car. Three 50 watt, 60 volt incandescent lamps are provided on the ceiling at the letter cases and are controlled by a fixed switch located on the end of the paper box near the letter case on the right hand side of the car. Two 50 watt, 60 volt incandescent lamps are provided on the ceiling, one for each door and are controlled by fixed switches, one on the end of each paper box.

One 50 watt, 60 volt incandescent lamp is provided on the ceiling of the RPO toilet and is controlled by a wall switch located on the toilet partition.

On the RDC-4, the platform lights, number signs, classification lights, headlights, regulator locker lights, generator pilot lights, gauge lights and speedometer lights are identical to the RDC-1, 2 and 3.

In the baggage section of the RDC-4, three 50 watt, 60 volt incandescent lamps are provided on the ceiling and are controlled by a switch located on the toilet partition. A 25 watt, 60 volt incandescent lamp is provided over each baggage door, the desk, in the baggage toilet, and each is controlled by individual fixed switches mounted on the light fixture.

In the RPO section of RDC-4, seven 50 watt, 60 volt incandescent lamps are provided on the center ceiling and are controlled by fixed switches located on the ends of the paper boxes. Six 50 watt, 60 volt incandescent lamps are provided, two in the center ceiling area and four on the ceiling above the distributing tables, and are controlled by a fixed switch located on the end of a paper box.

Two 50 watt, 60 volt incandescent lamps are provided, one over each door and are controlled by fixed switches located on the end of the paper boxes.

One 50 watt, 60 volt incandescent lamp is provided on the ceiling of the RPO toilet and is controlled by a fixed switch located on the toilet partition.

One 25 watt, 60 volt incandescent lamp is provided in the RPO wardrobe and is controlled by a fixed switch located on the wardrobe partition.

Provisions have been made in the lighting circuits to provide lighting in the RPO sections of the RDC-3 and 4 in the event that it is only necessary to use lighting in these sections. This arrangement provides a battery circuit to the RPO section when the 70 ampere main lighting breaker, located in the switch locker, is opened. This is accomplished by a relay which is energized by the closing of any one of the RPO light switches.

TO REPLACE LAMPS

1. Ceiling Lights

The ceiling light fixtures are provided with a removable glass lens for access to the fluorescent tube, starter, and ballast lamp. By loosening the screws around the bezel, the lens can be taken off the fixture.

2. Cove Lights

The cove light fixtures are provided with a removable glass lens for access to the fluorescent tube and starter. By removing the end cover on one end of the fixture, the curved glass lens can be removed by sliding it out of the fixture retaining clips.

3. Toilet and Vestibule

The toilet and platform lights are provided with hinged bezels. By loosening one knurled head screw, the bezel may be lowered.

4. Generator and Cooling Pilot Lights

The cooling pilot light is provided with a removable cover plate. Access to generator pilot lights is made by slipping the removable lens from its socket.

5. Gauge Lights

Remove the knurled nut which retains the socket in the gauge housing.

SECTION 11

ELECTRICAL CAB HEAT

(See Wiring Schematics)

Cab heat is provided by means of a Glocoil heater unit. One unit is located on the collision post at the operator's stand at each end of the car.

Each cab unit is equipped with five Glocoil heat elements. A switch with HIGH, LOW, and OFF positions is provided. In LOW position two elements provide heat, and in HIGH position, the five elements are used.

A centrifugal type blower is mounted above the heating elements which operates whenever cab heat is turned on. A guard provided with an inner shield covers the heating elements and directs the flow of heated air to the foot level of the operator. This guard is readily removed for replacement of Glocoil elements by loosening three slotted fasteners.

The blower motor unit is provided with sealed bearings and does not require lubrication.

The current supply to the cab heat circuit is normally available only when the engine and generator at the corresponding end of the car is operating. However, an emergency feature is provided to energize the cab heat circuit directly from the battery in the case of one engine or generator failure.

Two fuse cutouts are provided under the Engine Stop and Isolating Switch in each regulator locker. The right hand cutout is the NORMAL operating position and the left hand is for EMERGENCY operation.

A 50 ampere fuse is placed in the right hand cutout for normal operation.

In the event of a failure of one engine or generator, the 50 ampere fuse is removed from the NORMAL location and placed in the EMERGENCY location. Under no circumstance should a fuse be installed at both locations; and the fuse must be returned to the normal location immediately upon shutdown or repair.

SECTION 11

SUPPLEMENT 1

ELECTRICAL CAB HEAT

Cab heat on the basic RDC is provided on the operator's side only and is as described in Section 11.

This same arrangement is used on the Reading Company RDC-1's except that the emergency feature has been eliminated.

Additional cab heat is also provided on the fireman's side using similar Glocoil heater elements and centrifugal blower.

The Glocoil elements at operator's side, both ends, and fireman's side 'B' end may be replaced when required by removal of guard attached with slotted fasteners.

The guard at the fireman's side 'A' end is hinged for access to the Glocoils.

The blower motor circuits for each end are protected by 2.5 amp. cartridge fuses located in the respective regulator locker.

Glocoil element circuits are protected by 50 amp. cartridge fuses also located in the regulator lockers.

SECTION 12

ELECTRICALLY HEATED WINDSHIELD

The window directly in front of each operator's position is made up of two layers of glass bonded to a layer of vinyl. The inner surface of one glass is coated with a transparent electrically conductive coating. Install glass with conductive coating toward the outside. Identified by vendor's etched mark or paper sticker.

Metallic bus bars along the side edges provide the connections from the external electric supply to the conductive coating.

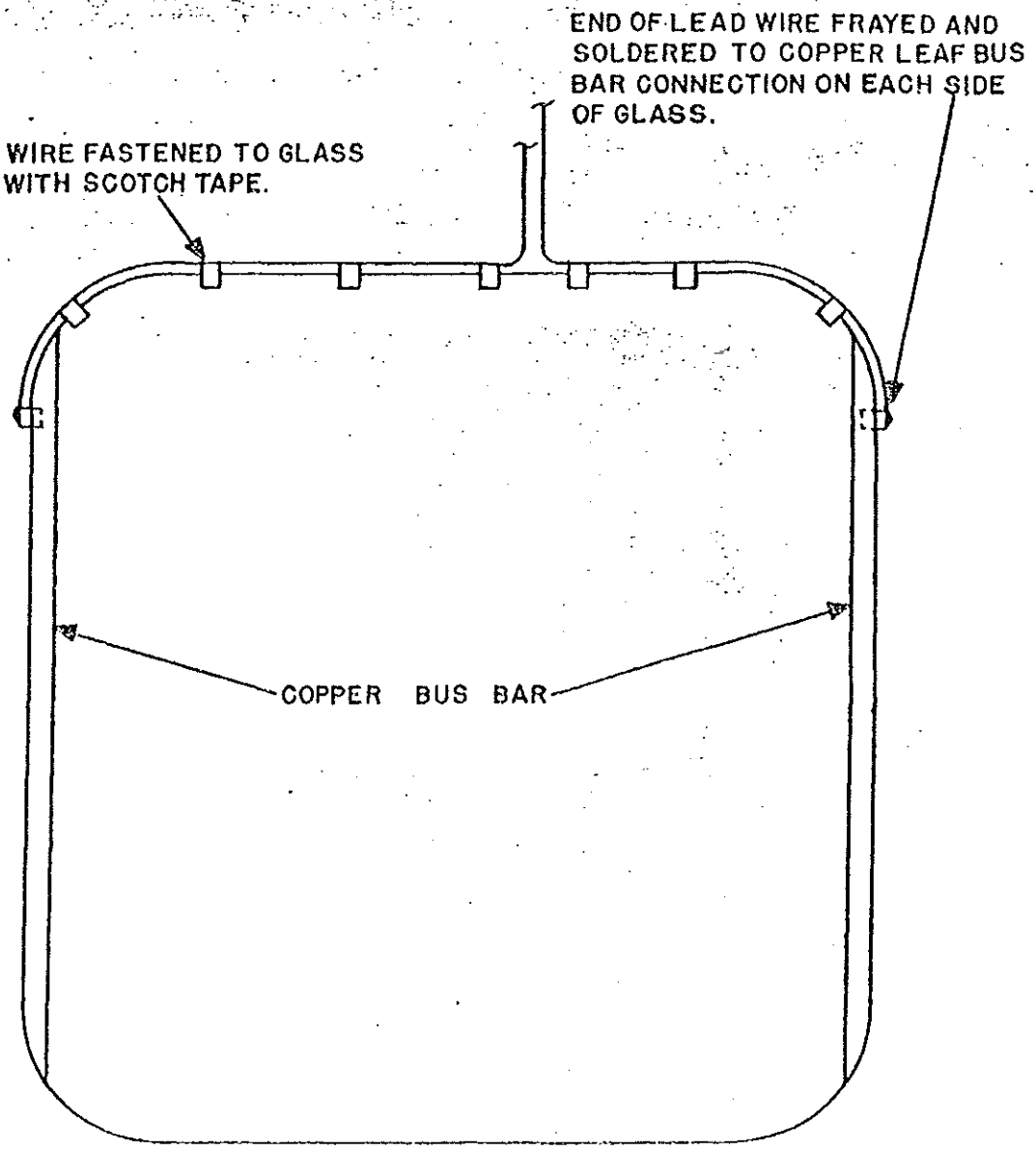
Upon passing a current through this coating, heat is produced across the inner surfaces of the glass. This heat, approximately 100 watts per square foot at 72 volts DC, provides the defrosting action.

This heating of the glass is controlled thermostatically according to the outside temperature. The thermostat is mounted directly on the inside face of the end sheet above the windshield. The outside face of the end sheet is exposed to the outside air temperature. The thermostat is non-adjustable, set to close at 50° and open at 65°. The contacts are suitable for 5 amperes at 60 volts.

If it should become necessary to replace a windshield, care should be used when attaching the lead wires. Small metal pads will be found on each edge of the glass near the top. The strands of the lead wires should be fanned out and tinned. Then, placing the fanned wires against the metal pads and heating with a clean tinned soldering iron, a quick well bonded joint will result.

It is recommended that overheating the metal pads be avoided to prevent the cracking of the glass or damaging the connection between pad and copper ribbon.

Tabs of Scotch tape should be placed over the lead wires along the edge of the glass to hold the wires in position at time of installation. See Fig. 1. Then apply a band of Scotch tape around the entire edge of the glass to prevent electrical leakage.



COPPER LEAF BUS BARS ARE LOCATED BETWEEN THE INNER SURFACES OF THE GLASS SO AS TO CONTACT THE ELECTRICALLY CONDUCTIVE COATING ON THE GLASS. THE LEAD WIRES ARE FASTENED TO THE GLASS WITH SCOTCH TAPE AND EXTENDED FROM THE TOP EDGE.

HEATED WINDSHIELD GLASS

FIG. 1

SECTION 13

ENGINE CONTROL

The direction of car movement and amount of power developed by the engines is regulated by a controller located in the cab at each end of the car. Movement of the reverse lever and throttle lever of this controller selects contacts to energize trainline wires running the length of the car. These trainline wires terminate in receptacles at each end of the car. A separate jumper cable equipped with a plug at each end can be inserted in the receptacles between coupled cars. In this way, the required electrical circuits are transferred from car to car permitting multiple car operation controlled from the operating cab. One jumper only is required between each car.

The trainline wires, in turn, energize certain traction relays located in the 'B' regulator locker of each car.

The closing of these traction relays connects the positive side of the battery of each car to one or more of the engine solenoids (depending on the position of the controller levers), thus selecting the direction of movement and amount of power developed by the engines. The direction of movement is controlled by the transmission solenoids and amount of power developed by the engine is controlled by the throttle solenoids.

Each power plant is provided with three protective switches: lube oil pressure, water temperature, and transmission oil temperature. The operation of any of these protective devices will energize the air shutdown damper solenoid. This solenoid closes the damper in the engine combustion air stream, thus stopping the engine. At the same time, it opens the switch in the negative circuit and de-energizes all throttle and transmission solenoids, thus disconnecting the engine from the driving axle. Since this function is confined to the engine in trouble, it has no effect on the other engine on the car or on any other cars in the train.

Each engine circuit is provided with an isolation switch located in the regulator locker. Throwing this switch from NORMAL to ISOLATE opens the negative wire to the throttle and transmission solenoids, de-energizing them. Thus, the operation of the isolation switch will disconnect the clutch and throttle solenoids, permitting the engine to operate at idle speed regardless of the position of the controller levers. The isolation switch for the #1 engine is in the 'B' regulator locker and for the #2 engine, in the 'A' regulator locker.

A plug is provided and attached to the reverser lever handle by means of a chain. The insertion of this plug into the master plug switch receptacle, just above the controller, connects the car battery

to both the TB+ and TB- trainline wires, thus setting up the sanding, signaling, air compressor and engine control circuits.

When RDC's are operated in multiple there must never be more than one plug in place in the train. The plug should be inserted only in the receptacle in the cab from which the train is being operated.

Since the cab controller energizes the trainline wire which in turn energizes the traction relays in each individual car, when coupled together, a consist of cars may be controlled from any cab in the train.

The various items comprising the engine control system are as follows:

1. Controller and Circuits

The controller consists of two groups of contacts enclosed in a housing - the reverser group and the throttle group. Each group is operated by means of a removable handle inserted through an opening in the housing. The levers are mechanically interlocked so that the reverser lever can be operated only when the throttle is in the OFF position and the throttle lever can be moved only when the reverser lever is in the FORWARD or REVERSE position.

The reverser lever has three positions: FORWARD - OFF - REVERSE.

The throttle lever has five positions: OFF - #1 - #2 - #3 - #4.

For illustration purposes, the following is written referring to the 'B' controller. See Wiring Schematic.

Based on the wiring of the control circuits, the car is considered moving forward when the 'B' end is leading. It must be kept in mind that when the #1 transmission is set up for forward movement the #2 transmission is set up for reverse movement.

When the throttle is in OFF position, all contacts are open and none of the trainline wires are energized for traction purposes.

Moving the reverser lever to the FORWARD position closes the circuit from "C" contact to "F" contact. When the throttle lever is moved from OFF to #1 position, "C" contact closes, setting up the circuit from B+ , through the 10 amp. circuit breaker, the FC1 wire, contact "C" to contact "F", trainline wire F, wire F to the positive side of traction relay FR.

Battery negative circuit is provided from wire B- , wire BB7- , the 20 amp. circuit breaker, wire FC3, the contact of the Master Plug Switch, wire TB- , trainline wire C - , wire C - to the negative side of FR relay.

With the traction relay FR thus energized, the contacts FR close. A circuit is now established from B + , through the 10 amp. circuit breaker, wire EM1 + , the FR contacts, the 4M1 wire to the positive side of FM1 solenoid.

Battery negative circuit is provided from B— , wire SB — , engine damper switch, 6F1 wire, locker isolation switch, 3F11 wire, 10 amp. circuit breaker, wire 3F1 to the negative side of FM1 solenoid.

With the electrical circuit thus set up the FM1 solenoid is energized, operating a valve on the transmission and permitting the forward clutch to be hydraulically made up.

When the throttle lever is moved from #1 position to #2 position, "C" contact is maintained closed so as to maintain clutch engagement. In addition, contacts "A" and "D" close. Contact "A" provides a circuit from battery positive B + , through the 10 amp. circuit breaker, wire FC1, the "A" controller contact to trainline wire T1, wire T1 to the positive side of TR1 traction relay.

Battery negative is provided to the TR1 traction relay as previously mentioned for the "FR" traction relay.

The traction relay TR1 now being energized closes its contact TR1 which provides a battery positive circuit to the TM11 solenoid.

Battery negative is provided to the TM11 solenoid as previously stated for the FM1 solenoid.

With the TM11 solenoid energized, the engine through the throttle control arrangement will be increased to 1/3 power.

The closing of contact "D" energizes the "DD" trainline wire with battery positive. This provision is made for interchange ability since earlier model engines were equipped with an electrical direct drive lockup unit. The function of the circuit was to energize the direct drive lockup units only after the throttle was advanced to #2, #3 and #4 positions. The lockup governors on the later model engines are hydraulic type and do not require an electrical circuit.

When the throttle lever is moved from #2 to #3 position, the "A" contact drops out, de-energizing its associtated circuit, and the "B" contact closes. Contacts "C" and "D" remain closed. Contact "B" provides battery positive to the trainline wire T2, wire T2 to traction relay TR2.

Battery negative is provided through wire C — as previously mentioned.

The traction relay TR2 now being energized closes its contacts TR2

which provides an energizing voltage to the TM12 solenoid. With the TM12 solenoid energized, the engine through the throttle control arrangement will be increased to 2/3 power.

Moving the throttle lever from #3 position to #4 position holds "B" "C" and "D" contacts closed and, in addition, closes "A" contact. Contacts "C" and "D" are held closed for reasons previously stated. Contact "B" is held closed as previously stated to obtain 2/3 power. The closing of contact "A" provides battery positive to the trainline wire T1, wire T to TR1 traction relay.

Battery negative is provided as previously stated through C — .

The traction relay TR1 being energized closes contacts TR1 which provides battery positive to the TM11 solenoid.

Battery negative being provided to the solenoid through the engine negative control wire SB — , 6F1, 3F11 and 3F1 as previously mentioned.

With the TM11 and TM12 engine solenoids energized, the engine, through the throttle control arrangement, will increase to FULL power.

Moving the throttle to OFF position de-energizes the traction relay and engine and transmission solenoids, permitting engines to return to idle.

Moving the reverse lever to the REVERSE position closes the circuit from "C" contact to "R" contact. When the throttle lever is moved from OFF to #1 position, "C" contact closes, setting up the circuit from B+ , through the 10 amp. circuit breaker, the FC1 wire, contact "C" to contact "R", trainline wire "R", wire R to the positive side of traction relay RR.

Negative battery is supplied to the negative side of relay RR as previously stated for relay FR for FORWARD direction.

With the traction relay RR energized, the contacts RR close. The circuit is now established from B+ , through the 10 amp. circuit breaker, wire EM1+ , the RR contacts, the 3M1 wire to the positive side of RM1 solenoid.

Battery negative circuit is provided to the negative side of RM1 solenoid as previously mentioned for the FM1 solenoid.

The same sequence takes place concerning the traction relays and engine throttle solenoids when motion of car is forward or reverse.

It should be noted that the "A" controller wiring is the same as the "B" controller wiring except for the forward and reverse wires, which are transposed.

The controller should be inspected periodically. The cover should be removed and all contacts checked for arcing and dressed if necessary. The terminal posts should be checked to see that all screws are tight and the interior of the controller should be blown out with dry compressed air. Lubricant should be applied to the oil holes in each end trunion and to each cam roller. (See the Budd Rail Diesel Car Lubrication and Fuel Chart). Do not oil the contact rollers.

2. Master Plug Switch

This is a three point plug switch mounted in the collision post just above and to the left of the controller in each cab. Normally its three contacts are open. The insertion of the plug closes these three contacts. As shown on the Wiring Schematic, one contact connects the FC2 wire to the TB trainline wire and the other contact connects the FC3 wire to the TB + trainline wire. The third contact is used to energize "Train Control" circuits on certain models. As mentioned before, the plug must be in place in order to have sanding, signaling, air compressor or engine controls effective in a car or train of cars. When operating multiple, only one master plug (at operating position) is required.

3. Traction Control Relays

These relays have double pole single throw, normally open contacts. There are four of these relays mounted on a panel in the #1 (B) end regulator locker. One side of the coil of each relay is connected to its associated trainline wire and the other side to the common C – wire.

These relays energize the traction solenoids mounted on each engine.

The contacts of these relays are extra heavy for the duty they perform and should need very little attention. However, they should be examined periodically and if found pitted should be polished with Crocus cloth to prevent further arcing or pitting. At the same time the action of the armature should be checked by pushing it closed several times to see that it is free in the hinge and the return spring is working properly.

4. Traction Solenoids

There are four traction solenoids on each engine. Two are located on the throttle box and control the setting of the injector racks. Two are located on the transmission, one controlling the forward clutch and the other the reverse clutch. These solenoids are of the double coil type. They have a heavy coil for pull-in and a light coil for holding. When first energized, both coils are in the circuit. As the core moves into position, it opens a contact which de-energizes the heavy pull-in coil, leaving the light coil in the circuit to hold the core in position.

5. Isolation Switch and Engine Stop Button

These two items are combined on one double throw switch located in the regulator locker. This switch has two fixed positions: NORMAL and ISOLATE and a momentary contact position, STOP. As shown on Wiring Schematic, positioning the switch in the NORMAL position completes the negative side of the circuit to the engine solenoids. If the switch is moved to the ISOLATE position, the circuit is broken and no traction solenoid will function even though their corresponding traction relay contacts are closed. Thus, one engine on the car can be left in the IDLING position but cut off from propelling the car while the other is used for propulsion. Moving the switch to the STOP position and holding it there, energizes the fuel shutoff solenoid on the engine. This shuts off the fuel to the injectors and the engine will stop. If the engine is stopped as above, the switch should always be thrown back to the NORMAL position after the engine has come to a stop.

6. Air Damper Solenoid and Switch

All of the engine protective switches are connected in parallel and in series with the air damper solenoid. In the event any of these protective switches close their contacts due to abnormal conditions of oil, water, or speed, the air damper solenoid will become energized. Energizing this solenoid trips a latch, permitting a damper on the engine to shut off the combustion air to the cylinders, stopping the engine.

When the damper closes, it opens the air damper switch. Since this switch is the final connection to the B- wire of all the solenoids, and protective switches on the engine, its opening "clears the board" and all solenoids drop out, disconnecting the engine and transmission from the drive shaft on the car.

The only way the engine can be re-started and restored to normal operation is to re-set the air damper manually and push the start button.

7. Trainline Plugs and Receptacles

Two trainline receptacles are provided on each end of the car. The receptacles are provided with a gasketed cover. Although this cover is watertight, under certain atmospheric conditions condensation may collect inside the receptacles and cause grounds on the trainline circuits if not removed periodically. The covers of the receptacles should be opened frequently and the interior checked for moisture. If any is detected, it should be blown out with dry air. Careful inspection of the surface around the metal contacts should be made, and if any carbonizing is found the plug should be replaced.

The connections and detail wiring of these plugs and receptacles is shown on the Wiring Schematic. If a receptacle has been removed, when replacing, care should be taken to position the F and R wire on the proper terminal of the terminal strip. It is to be noted that these wires are alternated in #4 or #5 position, depending on the location of the receptacle in the car. This transition is made in order to provide proper directional control.

8. Circuit Breakers

All circuit breakers in the engine control circuits are located in the switch locker at the 'B' end of the car. These circuit breakers are:

a. Cab #1 Controller -- 10 amp.

b. Cab #2 Controller -- 10 amp.

c. Trainline Supply -- 20 amp.

d. Engine #1 Solenoids -- 10 amp.

e. Engine #2 Solenoids -- 10 amp.

TRACTION RELAY AND SOLENOID SEQUENCE TEST

1. With master plug out, test that the TB plus and TB minus circuits are de-energized. The test can be made by pressing the signal switch, and the sanding switch; these should be inoperative.

2. Insert master plug and test that the TB plus and TB minus circuits are energized. This can be done by checking that the sanders, the signal buzzer, and the controller will function.

3. Apply handbrake, start both engines and charge up the air system. When fully charged, apply air brake. It is important that the brakes remain applied, as the following tests will be made with engine clutches engaged and throttle open for maximum speed.

4. Put reverser in forward position.

5. Isolate engine closest to controller from which test is being made.

6. With reverser positioned, advance throttle to #1 position. Note that the clutch will be felt to engage.

7. Advance throttle to #2 position and note that engine speed increases. Advance throttle to #3 position and note that the engine speed increases. Advance throttle to #4 position and note that

the engine speed increases to maximum. Return throttle immediately to #1 position.

8. Move isolation switch to normal position and note that the clutch on engine closest to the controller from which the test is being made will pick up.

9. With isolation switch in normal position, repeat test in item No. 6 and note that the controls on engine closest to controller respond to all control positions.

10. Put reverser in reverse position and repeat tests in items No. 5, 6, 7, 8 and 9.

11. From controller in opposite end of car, repeat all test items 1 thru 10.

12. Check that engines can be stopped from both the isolation switches and the engine stop switches on the engine panels. Note that when either of the above methods have been used to stop the engines, that the air damper levers have been tripped by the emergency air shutdown solenoids.

SECTION 13

SUPPLEMENT 1

ENGINE CONTROL

Engine control on the Reading Company RDC-1's is similar to the basic RDC except that engines can also be started and stopped by push buttons located in the regulator lockers.

Further, on the Reading Company cars, manual reset of engine air dampers is automatic rather than manual.

TRACTION RELAY & SOLENOID SEQUENCE TEST

When making traction relay and solenoid sequence test, proceed as covered by items 1 to 11 inclusive.

As Reading Company engines can be stopped by the following methods all must be checked:

1. By stop button on engine control panel. This will stop only the engine on which the button is pushed.
2. By engine STOP push button located in the respective regulator locker. This will stop only the one engine involved.
3. By isolation switch located in the respective regulator locker. This also will stop only the one engine involved.
4. By push button "STOP-ALL ENGINES-ALL CARS" located in regulator lockers both ends. This will stop all engines on all cars in train as this circuit is trainlined.

In all cases push button or isolation switch must be held until engine has stopped as indicated by generator pilot light.

SECTION 14

SPEEDOMETER

The speedometer equipment consists of an A.C. generator and a round flush wide flange D.C. indicator.

The indicator is located in the center of the controller housing, protected by a plastic cover. It is a D.C. meter with built-in copper oxide rectifiers and is calibrated in m.p.h. on a black dial with green phosphorescent figures.

A zero adjusting screw is provided in the center of the non-shatterable glass lens. Adjustment is accomplished by turning the slotted adjustment screw:- slightly counterclockwise to lower the reading and clockwise to increase the reading. This adjustment is made with the car standing still. Unnecessary movement of the zero adjusting screw will break off the bakelite nibs which contact the needle mechanism.

The generator is located on the transmission and is driven by the transmission output pump shaft through a square drive shaft. The drive shaft locks into the generator by means of a spherical knob on the end of the shaft which is forced into a snap ring in the generator shaft pocket. Care should be taken that the drive shaft is secure on the generator before mounting the generator on the transmission.

The square end of the drive shaft engages a square broaching in the output pump shaft. A piece of felt 1/4 inch diameter and 11/16 inch long must be maintained in the broaching before inserting the shaft. The omission of the felt may permit the shaft to become disengaged, thereby making the speedometer inoperative.

The generator is connected to the indicator wiring by means of a two pin quick disconnect plug located at the generator. The clamping nut secures the wire connection in place, and should be checked periodically for tightness. The clamping nut is drilled for a safety wire. The safety wire should be checked periodically to insure tightness of the plug assembly and prevent speedometer failures.

The only maintenance necessary for proper operation is to keep the electrical connections clean and tight. There are no adjustments other than the above mentioned zero adjustment on the indicator.

The manufacturer has agreed to supply calibrated units to those who wish to make up a checking machine. When purchasing such units it should be made known that the units are wanted for test purposes.

The indicator as supplied with cars equipped with 34 inch wheels has a special calibrated scale. These instruments are stenciled accordingly. The instrument may be used on all cars with smaller wheel diameters, providing proper resistances are connected in series. See the Resistance Chart for proper resistances required for various wheel diameters.

The tachometer generator is identical for all cars.

RESISTANCE CHART

34 inch wheels	--	No resistance required,
33 inch wheels	--	182 ohms required.
32 inch wheels	--	378 ohms required.
31 inch wheels	--	586 ohms required.

SECTION 15

COMMUNICATING BUZZER

The communicating systems of the RDC-1, 2, 3 and 4 consist of a push button located in the collision post door header in each vestibule and a buzzer located at each operator's position. The buzzer is mounted on the underside of the cab shelf. There is a 1/4 inch drain hole located in the center of the buzzer cover, to prevent accumulation of moisture.

There is an additional push button provided on the RDC-2, 3 and 4, located next to the light fixture over the right hand side baggage door.

The buzzers operate on 64 Volt D.C. ungrounded systems.

The electrical circuit for this system is trainlined so that communication is available throughout all cars in multiple operation.

The plug of the master plug switch must be inserted into the switch receptacle in order to operate the communication system.

SECTION 16

FUEL TANK, GAUGES AND ASSOCIATED EQUIPMENT

The centersill mounted, 250 gallon, fuel tank is constructed of stainless steel. A two gallon sump is provided on the bottom at the center of the tank to collect condensate and sediment. The fuel to the engines is drawn from the top of this sump, thus allowing the water and sediment to settle at the bottom, where it can be drained off by means of a drain cock.

The tank is filled through a fuel fill assembly provided with a screen to exclude foreign matter from the tank. Two fuel fill assemblies are provided per tank, one on each side of the car.

The tank is provided with a whistle alarm to prevent overfilling. The alarm will sound until the tank is nearly full, at which time the whistling stops.

The tank is vented from the top. The vent is provided with a dead ball check that insures pressure to sound the whistle alarm. The dead ball check also provides full venting if conditions require.

The venting, which is necessary as oil is consumed, is accomplished through the whistle.

Two Glo Rod type liquid level gauges are provided, one at each side of the car. The fuel level is indicated where the series of dots (oil) changes to a series of horizontal bars (no oil).

Each gauge is equipped with a shut-off valve at the top and bottom of the unit. The shut-off valves are located on the left side of the unit and are closed when cleaning the glass or when glass is damaged. The valves must normally be open in order to read the oil level.

The fuel is piped from the tank to the engines through steel tubing, electrically grounded to the car frame and provided with flexible connections with quick disconnect self-sealing fittings at the engines.

An emergency safety cut-out valve is located adjacent to the sump in the fuel feed pipe to the engines. The valve is cable operated by emergency pull rings stenciled FUEL SHUT-OFF. One ring is provided at each fuel fill assembly and one at each operator's position.

Once the valve has tripped it must be manually reset. Pull RESET-FUEL EMERGENCY VALVE handle located at side of car adjacent to fuel fill assembly, either side of car. Pull straight out to end of travel and release.

WARNING

This method should never be used as a means of normal shutdown of engines but only in the case of an extreme emergency -- fire, etc. The injectors may be ruined by this method of shutdown.

SECTION 16

SUPPLEMENT 1

FUEL TANK, GAUGES AND ASSOCIATED EQUIPMENT

FUEL TANK

Fuel tank as provided on the Reading Company RDC's is larger than standard and has a capacity of 340 gallons.

REFUELING

These cars are equipped with fittings (coupler valve) on both sides of the car as part of the Houston H-1020 Automatic Refueling System.

Parts breakdown and maintenance information are covered in detail in the vendor's manuals.

These may be obtained from:

The Houston Company
266 Sand Bank Road
Cheshire, Connecticut

SECTION 17

COMBUSTION AIR SYSTEM

Combustion air for each engine is drawn from the roof area through a 6 inch diameter stainless steel pipe mounted vertically in the stack area.

An oil washed air cleaner is mounted to the floor structure with 3 wing brackets. The vertical pipe and air inlet at top of cleaner is secured and sealed with a sheet metal clamp.

The air cleaner consists of one removable and one stationary wire mesh filter element located above the oil pan in such a way that the force of the air passing through the oil in the pan, sprays the oil on the filter elements and keeps them soaked to remove fine particles of dust from the air. Refer to figure 1.

The air outlet located on the side of cleaner is connected to a combination of 6 inch diameter stainless steel pipes and flexible hoses terminating at the air intake housing on the engine.

A quick disconnect coupling is provided between the 2 lengths of flexible hose to facilitate quick engine removal.

To prevent entry of dust and dirt into the engine, all joints in the air intake system should be checked periodically and maintained tight.

SERVICING THE OIL CLEANER

The oil pan at the bottom of the cleaner should be removed periodically and oil level checked. See Budd Rail Diesel Car Lubrication and Fuel Specifications.

The oil need be changed only when there is an excessive amount of grit and dirt (1/8" to 1/4") in the bottom of the pan.

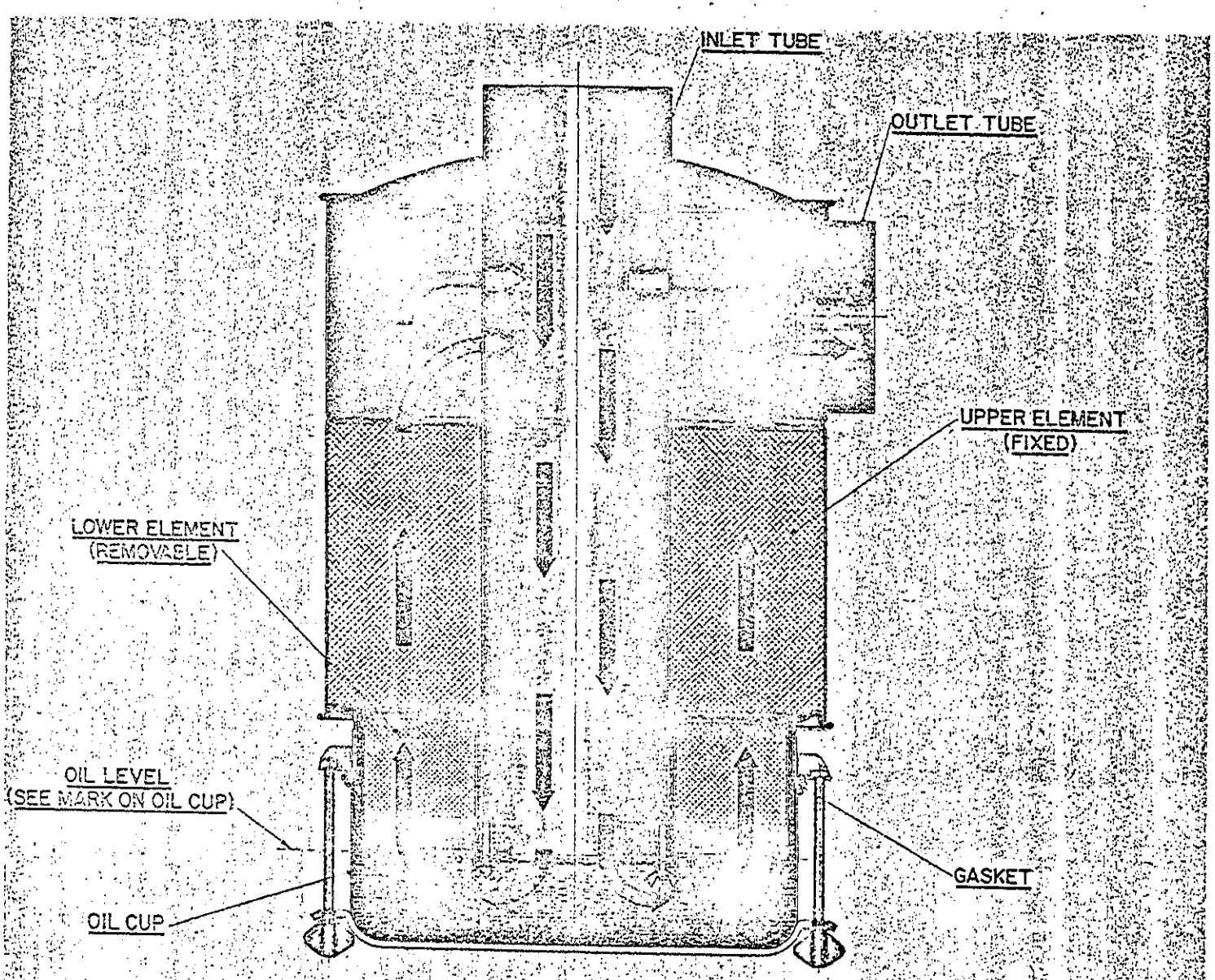
The lower portion of the air cleaner element should be removed frequently, washed in fuel oil and replaced.

The air cleaner should be removed yearly for cleaning of the upper element and the center air intake tube.

As the engine combustion air is drawn directly from the atmosphere through a screen in the roof, there are times when it is impossible to prevent the entrance of a small amount of snow. When this condition occurs, more frequent check of the oil level in the

air cleaner should be made as melting snow will cause high oil level. Oil level can become high enough to choke off the air flow and partially starve the engine, resulting in loss of power and engine shutdown. If the engine is erratic in starting, the air cleaner should be checked to see if this condition exists.

For operation at below freezing temperatures, refer to name plate on air cleaner for oil specifications.



AIR CLEANER ASSEMBLY

(ENGINE COMBUSTION AIR SYSTEM)

FIG. 1

SECTION 18

EXHAUST SYSTEM

One stainless steel muffler is provided for each engine, two per car, and are mounted vertically in a stainless steel stack, one at each side near the center of the car. Each stack is wrapped with fiberglass insulating blankets.

The muffler is bolted to and supported on a steel bracket at the lower end. The bracket is welded to the exhaust pipe assembly and is supported at two points on vibration absorbing coil springs. The springs are mounted on supports attached to the car body.

The upper end of the muffler is steadied by means of a loose fitting collar at the tail pipe.

Each end of the muffler is provided with a four bolt flange for attachment of the exhaust pipe and tail pipe. No gaskets are required at the flanges due to the fire seal contstruction of the flanged end of the tail pipe and both ends of the exhaust pipe.

The exhaust pipe between the muffler and the engine is a stainless steel tube mounted under, and running parallel to, the floor. The pipe assembly consists of three sections. The section of pipe at the lower end of the muffler is bolted to the muffler flange and supported on coil springs as mentioned previously. A bolted slip joint is provided at the end of this section for convenience when removing or installing the exhaust pipe. The section attached to the engine exhaust manifold flange is provided with a slip joint which permits fore and aft movement for expansion purposes and provides flexibility in the exhaust pipe to take up lateral movement and vibration of the engine.

Two Johns Manville type packing rings provide a seal for this joint. They are held in position by means of a retaining ring and clamp assembly. If there should be an exhaust leak at the joint, tighten the clamp in order to draw up the packing ring.

The exhaust muffler can be removed from the car by lifting vertically out of the exhaust stack after first removing the tail pipe collar, and unbolting the lower flange of the muffler.

The exhaust pipe slip joints should be checked whenever an engine is removed to see that they move freely fore and aft. If the joints are found to be tight, the pipe should be dismantled and the carbon deposits removed.

The engine exhaust manifold is attached to the engine by means of seven studs and nuts. Like any other combustion engine, these bolts have a tendency to loosen due to expansion and contraction. A check should be made periodically to see that nuts are tight. A loose nut will permit exhaust blow-by resulting in damage to the gasket. Whenever it is found necessary to replace manifold gaskets, be sure to apply a double gasket at this point.

SECTION 18

SUPPLEMENT 1

EXHAUST SYSTEM

The engine exhaust system on the Reading Co. RDC-s' is similar to the basic RDC as covered in Section 18, except that the slip joint and a short portion of the stainless steel tube is omitted and replaced with a flexible exhaust link as furnished by the Houston Company.

To remove the exhaust from the engine manifold, remove the 4 attaching bolts and compress flexible tube sufficient amount to separate flanges.

SECTION 19

SERVICE WATER SYSTEM

Service water for the RDC-1 is gravity fed from an overhead 75-gallon stainless steel insulated tank, strap supported from the roof structure above the ceiling at the #2 (A) end of the car. The tank is made accessible through a trap door in the vestibule. A grille is provided in the low ceiling area, at the #2 (A) end of the car, for circulation of warm air in the tank.

The tank is filled through spud fillers. One filler located under the skirts on each side of the car at the #2 (A) end. As one spud is being used to fill the tank, the other acts as a vent and overflow.

In the event of freeze-up of the spud fillers, the water tanks on all cars will be vented through a "U" shaped anti-freeze tube extended above the roof of the car, thereby permitting water to flow to the various fixtures.

The water piping from the tank to the #1 (B) end of the car is routed inside of the heater guard on the left hand side of the car.

Cold water only is supplied to the basins and hoppers.

The service water system for the RDC-2 is similar to that of the RDC-1 except that the 75-gallon tank is uninsulated and is supported from the ceiling in the baggage section. The fill spuds are located under the skirt on both sides, at about the center of the car.

The water is supplied to only one annex on the RDC-2 and is also routed through the heater guards on the left hand side of the car.

The service water system for the coach section on the RDC-3 is the same as for the RDC-2.

Hot water is supplied to the R.P.O. section, on the RDC-3, from a 6-gallon stainless steel tank supported from the ceiling over the toilet section. This tank is supplied with water from the 75 gallon service water tank located in the baggage section.

The 6-gallon hot water tank is provided with an immersion heater mounted in the tank and is controlled by an immersion thermostat set for 140°.

The cold water for the basins and hoppers in the R.P.O. and passenger sections are supplied from the 75-gallon service water tank.

The fill spuds for the 75-gallon supply are located under the skirt on both sides at about the center of the car.

Shut-off valves are provided in the feed lines from the tanks to the basins and to the hoppers.

Drain valves are provided in the feed lines (in heater guards) to each basin and hopper for draining tanks and piping.

On the RDC-4 the cold water for the basin and hopper in the baggage section is supplied from a 20-gallon service water tank. The tank is suspended from the ceiling above the toilet area in the baggage section. The fill spuds for this tank are located under the skirt at the #1 (B) end of each side of the car.

The cold water for the basin and hopper in the RPO section is supplied from a 30-gallon service water tank. The tank is suspended from the ceiling at the #2 (A) end of the car. The fill spuds for this tank are located under the skirt at the #2 (A) end on each side of the car.

Hot water is supplied to the RPO basin from a 6-gallon stainless steel tank supported from the ceiling over the toilet section. This tank is supplied with water from the 30-gallon service water tank located in the RPO section.

The 6-gallon hot water tank is provided with an immersion heater mounted in the tank and is controlled by an immersion thermostat set for 140°.

SECTION 20

SASH GLASS

All sash in the passenger section is provided with double glazed fixed glass set in glazing rubber and mounted in an aluminum frame.

The outer pane is polished plate and the inner pane is clear laminated.

The outer and inner panes are spaced approximately 1/4" apart. This space is provided with a breather tube which permits the air between the two sealed panes of glass to adjust quickly to changes in temperature and altitude, keeping the window clear at all times and eliminating the danger of breakage due to pressure changes.

The breather tube is inserted through the glazing rubber at the top center of the sash unit and connects with a chamber containing a wad of cotton which acts as a filter. All air passing through the breather tube is filtered by the cotton wad.

If moisture forms on the inside of the panes in the air space, inspect the breather tube.

The glass in the car body end doors are single fixed laminated, set in glazing rubber in the door proper, requiring no sash frame.

The glass in the baggage and R.P.O. section doors are double glazed, set in an aluminum frame.

The glass in the R.P.O. windows is single laminated and set in a lift type sash.

The side door of the operator's cab, at each end of the car, is equipped with a drop sash. At the top of the sash are two handholds for lifting or lowering the sash. The sash lowers into a recess in the door. When in a raised position, a turned down lip at the bottom of the sash unit engages over the outer edge of the window opening of the door, holding the sash in place.

The operator's cab windshield is a single fixed laminated glass set in glazing rubber. One inner surface of the glass is treated with an electrically conductive coating for defrosting.

CAUTION: In handling the above windshield, such as during application, care must be exercised to avoid placing strain on wire leads. The wires are easily torn from the connection to the glass. The wires are passed through a slit cut in the glazing rubber.

The collision post end doors are provided with single fixed laminated glass set in glazing rubber in the door proper.

The fireman's windshield is single fixed laminated glass polished plate outside with .030" thick vinyl bonding layer and semi-tempered polished plate inside. The total thickness of glass is .334".

The vestibule side door (non-cab side) has single fixed laminated glass, set in glazing rubber in the door proper.

Removal of Double Glazed Sash Unit from Car Opening.

The sash unit is removed from the inside of the car in the following manner:

1. Remove the curtain guides from each side of the window.
2. Remove the sash retaining screws from the flange of the sash unit and lift the sash unit from the car opening.

Re-glazing Double Glazed Sash Unit.

1. Lay the sash unit flat on a table or bench with the face of the unit showing the screw heads on the upper side.
2. Remove all screws except the screw cap of the breather.
3. Lift off upper half of frame.
4. Remove glass assembly (glass, rubber and breather) from lower half of frame.
5. If one of the panes is undamaged, mark with a small piece of adhesive tape or crayon to show point at which breather is applied.
6. Remove rubber from glass but do not remove the breather from the rubber.
7. Examine the piece of glass used to replace the one already in the unit. It is very important that the glass is of the same type, thickness and dimensions as the one removed; if not, the seal around the edges may be loose and there would be danger of leakage. Glass should be free of sharp edges so as to avoid cutting the rubber.
8. Clean both panes of glass, particularly on the faces that go toward each other. Be sure no lint, dust, finger marks or smudge spots are left on the glass.

NOTE: Due to the fact that after the glass has been installed in the sash unit, it is not possible to do further cleaning on the two inside faces. It is desirable that care be taken to see that they are perfectly clean before being assembled. Experience has shown that it is well to watch the following:

a. That the table or bench on which the glass is to be cleaned is free from particles of metal or other substances which may scratch it. A piece of clean cloth or felt will serve the purpose.

b. The cleaning compound should be of such a nature that it will not scratch or mar the glass or leave a film or oil surface.

c. The cloths used for cleaning should be clean and free from dirt or particles that may scratch the surface of the glass and of such a nature as will not leave lint or similar particles on the surface of the glass.

d. Be careful to handle the glass in such a way that it will not become finger marked after cleaning.

9. Clean the rubber to be sure no dirt has adhered to it. If the rubber shows any damage or is torn, replace it with a new one.

10. Stand the two panes of glass on edge with the cleaned faces toward each other and with the spot marked for the breather location at the top.

11. Apply the rubber to the glass, placing the breather at the point marked on the glass. Be sure the breather screw cap will face toward the inside of the car. Start to apply the rubber at the breather and work both directions across the top, then down both sides, after which reverse position of the glass and complete across the bottom. Go over again to make sure the rubber is all the way on.

12. After the rubber is applied, check to see that the breather is correctly located. If not, lift rubber from the top edge of the glass and firmly pull until it is. Then work the rubber down the sides and across the bottom to make an even application.

13. Place glass and rubber assembly back in the metal frame. See that the breather is located in the center of the notch cut in the frame. It is important there be no binding of the breather and that it is free on all sides.

14. Replace upper half of metal frame.

15. Replace all screws and tighten so there is equal pressure on all four sides of the unit. Go around two or three times to be sure all screws are turned up tight.

16. When placing unit in the car opening see that it is so set that the breather is located at the top with the screw cap toward the inside of the car and the tube toward the outside.

Installation of Sash Unit to Car Opening

Reverse the procedure outlined under "Removal of Sash Unit from Car Opening."

The glass in the doors and cab windows, except the drop sash at the operator's door are replaced from the outside. Remove the rubber retaining strip from glazing rubber. The glazing rubber is then removed, releasing the glass.

SECTION 21

WHISTLE

Two Leslie S-25 single tone Supertyfon chime whistles are provided and are located on the cab roof, one at each end of the car.

MAINTENANCE INSTRUCTIONS

Cleaning Diaphragm and Diaphragm Ring

1. Remove back cover and diaphragm ring.
2. Remove diaphragm by removing diaphragm ring screws.
3. Wipe nozzle as well as diaphragm and diaphragm ring to remove all foreign matter.

Cleaning Air Lines

Whenever a back cover is removed it is good practice to blow out the air lines by opening the operating valve with full pressure on the line. This will also clean out orifice dowel pin.

When replacing the back cover, install lockwashers and tighten cap screws. Rewire cap screws.

No adjustment is necessary.

Replacing Whistle

1. Remove cap screws which retain the horn and diaphragm housing to the horn base.
2. Support the diaphragm housing with one hand and carefully pull horn out.

NOTE: Orifice dowel pin is permanently fastened to horn and should not be removed.

3. Before replacement horn is installed, coat the outer surface of the small end with varnish.
4. Clean gasket faces of diaphragm housing and horn.
5. Apply gaskets, one at the horn and one at the diaphragm housing.
6. Slide horn into horn base and diaphragm housing.

7. Install cap screws and lockwashers.

8. Tighten cap screws firmly and rewire.

Replacing Orifice Dowel Pin

If it is necessary to replace the orifice dowel pin, insert it into the horn with the orifice facing outward and in line with the rib of the horn.

Air Line Strainer

One hair type strainer is provided in the air supply line to each whistle. This strainer should be cleaned periodically. Wash hair filter in a suitable solvent solution to remove all foreign matter. The strainer is accessible thru the ceiling trap door located over each vestibule.

SECTION 22

SANDING

Sanding can be initiated by any one of three methods. Refer to Schematic Wiring, figure 2.

MANUAL - by push button on master controller cover.

AUTOMATIC - by the Rolokron anti-wheel slide equipment at the approach of wheel slide when accelerating of decelerating.

The closing of any pair of Rolokron contacts energizes the three-second sanding relay, thus energizing the sanding relay valve.

EMERGENCY - by emergency brake application thru a pneumatic switch located inside the #1 engine casing and connected to the #15 port of the D22HR control valve.

An emergency brake application closes the pneumatic switch, energizing a 30-second time delay relay. The closing of the relay contacts energizes the sanding relay valves and provides 30 seconds of sanding.

A contact is provided in the pneumatic switch, which opens the negative (-) supply to the Rolokron circuits and nullifies the Rolokron anti-wheel slide protection during emergency brake application.

TWO-RATE SANDING - Refer to figure 1.

Two-rate sanding is provided by the following equipment located in the 'B' end regulator locker:

Two electro-pneumatic sanding relay valves
One solenoid valve
Adjustable orifice valve
Check valve
Cut-out cock
Associated piping

During manual sanding, the solenoid valve closes, permitting air at main reservoir pressure to pass through the adjustable orifice valve. This limits the air pressure delivered to the farthest sand trap to 68 p.s.i., thus reducing sand delivery to the rail.

During automatic or emergency sanding, the solenoid valve remains open and supplies main reservoir pressure to the sand traps, thus a higher delivery rate to the rail.

Delivery rate during manual sanding is 10-22 oz. per rail per minute.

Delivery rate during automatic and emergency sanding is 40-56 oz. per rail per minute.

To set the adjustable orifice valve, a gage must be installed in air line at the sand trap farthest from the valve. With the main reservoir pressure at or near minimum pressure setting, adjust the valve to obtain 68 p.s.i. plus or minus 2 pounds.

SANDING DIRECTION CONTROL

To insure sand delivery ahead of the leading wheels of each truck during manual and automatic sanding, a RESET SAND DIRECTION push button is provided. Button is located on the master controller cover.

After setting the directional lever in FORWARD or REVERSE, press the RESET SAND DIRECTION button. This will set the directional sanding relay in the direction in which the car will move. Sanding relay will then hold in that direction regardless of reverser lever setting.

CAUTION:- Intermixing of cars with and without manual directional sanding control will result in the following:

(a) With head end car equipped with manual directional sanding control, sanding equipment on all cars will function normally provided reset button is operated as instructed.

(b) If car without manual directional sanding control is used as head end car, manual directional sanding control will be lost on all cars in consist. Sanding direction will, however, remain under the control of the FORWARD and REVERSE lever on all cars without manual directional sanding control.

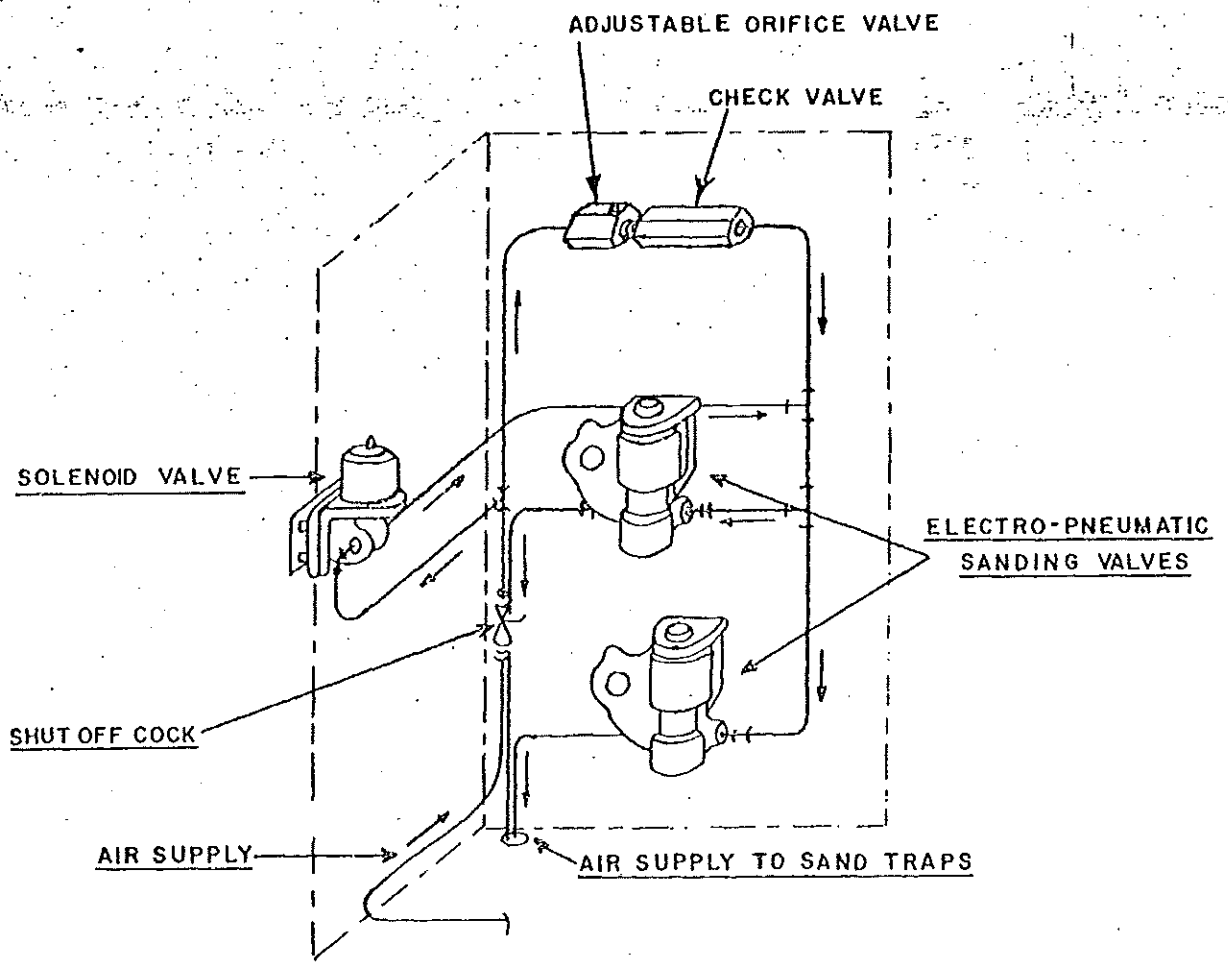
To insure sanding in the proper direction on cars with manual directional sanding control, the reset button must be pressed on one car after the transmission clutches are engaged.

MAINTENANCE

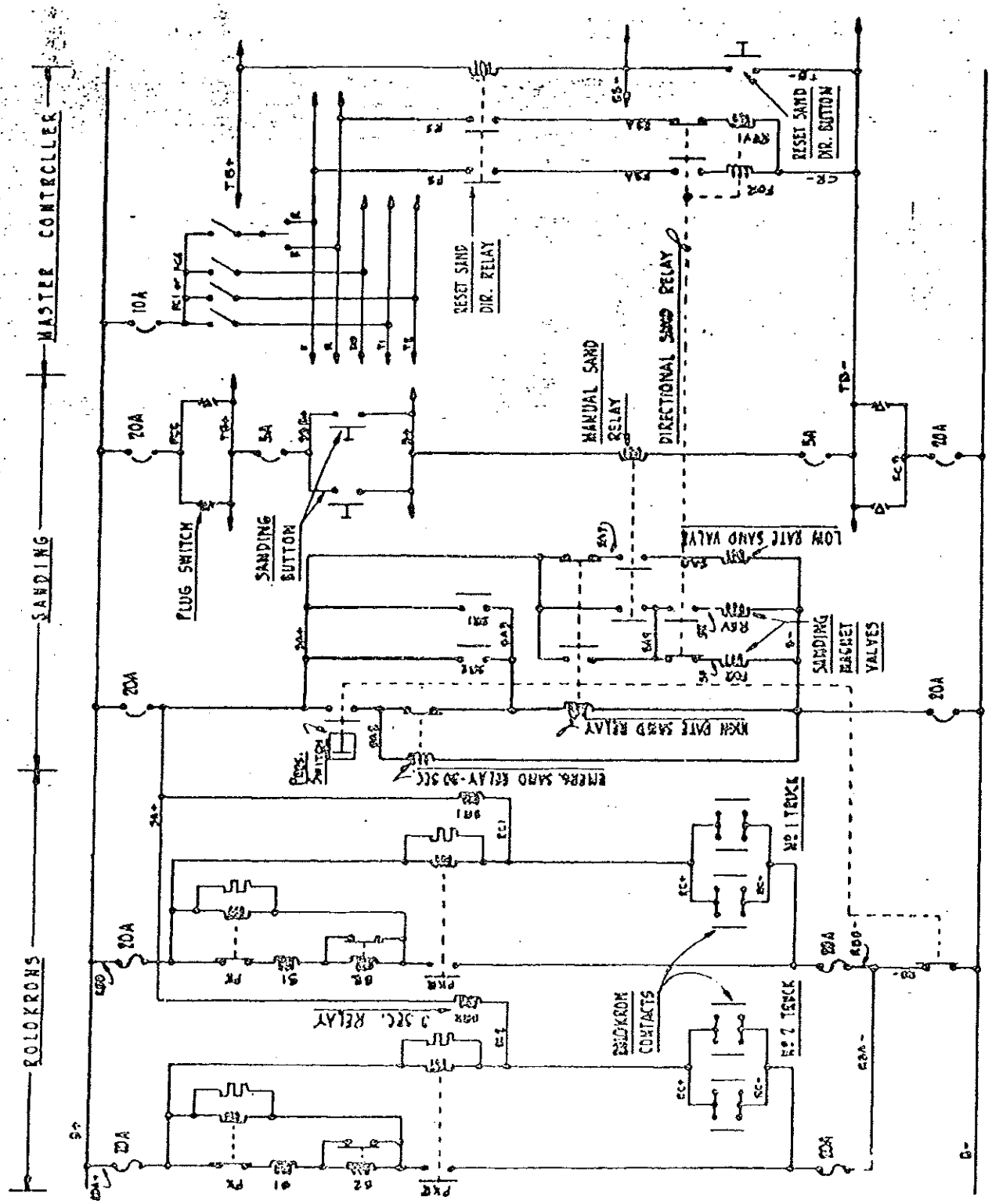
SOLENOID VALVE - Refer to Skinner Electric Valve Division, The Skinner Chuck Company's Bulletins #D18.5.2 and EV-2-RI.

ELECTRO-PNEUMATIC SANDING VALVES - Refer to Westinghouse Air Brake Bulletins.

SAND TRAPS - Refer to Westinghouse Air Brake Bulletins for HS-92 Sand Trap.



TWO RATE SANDING VALVE ARRANGEMENT
FIG. 1



SANDING SCHEMATIC

SECTION 22
FIGURE 2

SAND STORAGE

Eight sand boxes, each with a capacity of approximately 75 pounds, are mounted underfloor, one adjacent to each wheel.

A screen is provided inside the box near the bottom. This screen can become clogged with pebbles, etc., and should be inspected and cleaned periodically.

Sand flows from the storage boxes into the HS-92 sand traps which are attached to the bottoms of the boxes. The sand traps are connected to rubber sanding nozzles by means of sand delivery hoses.

When sanding is required, sand is carried by compressed air from the sand trap through the delivery line to the nozzle where it is directed to the rail and wheel contact.

The RDC sanding equipment is designed for use of sand that meets AAR Specification #916-51. Only sand meeting this specification should be used.

For complete explanation of sanding equipment see the Air Brake Instruction pamphlets.

SECTION 22

SUPPLEMENT 1

The Reading Company RDC-1s are provided with type 26-R Brake Equipment.

Sanding system is similar to the basic RDC except that the pneumatic switch controlling EMERGENCY sanding is connected to the #1 port of the 26-C control valve.

For detailed description and maintenance of Electro-Pneumatic Sanding Valves and HS-92 Sand Traps refer to New York Air Brake Company Bulletins.

WATER DRAINING INSTRUCTIONS
- UNDERFLOOR -

1. REMOVE PLUGS FROM BOTTOM OF WATER TANK TO DRAIN WATER FROM ENGINE COOLING SYSTEM AND ENGINE WATER JACKETS. OPEN PET COCKS ON CAR HEAT PUMP AND PUMP DISCHARGE PIPE TO DRAIN CAR HEATING SYSTEM.

2. OPEN PET COCK TO DRAIN WATER FROM ENGINE WATER PUMP INSIDE ENGINE CASING.

3. OPEN DRAIN (EXTENDED HANDLE ON LOWER SIDE OF ENGINE) TO DRAIN WATER FROM OIL COOLER-LOWER PIPE BETWEEN COOLERS.

4. APPLY TAG TO WATER FILL SPUDS AND ENGINE STARTING PANEL AND OIL COOLER DRAIN HANDLES TO INDICATE THAT VALVES ARE OPEN.

- ABOVE FLOOR -

5. OPEN COCKS ABOVE FLOOR IN MEN'S & WOMEN'S ANNEX, & UNDER REMOVABLE SEATS TO COMPLETE DRAINAGE OF RADIATION.

6. OPEN COCKS IN MEN'S & WOMEN'S ANNEX AND UNDER REMOVABLE SEAT ("A" END) TO DRAIN OVERHEAD TANK.

7. OPEN ANNEX BASIN FAUCETS AND WATER COOLER FAUCET.

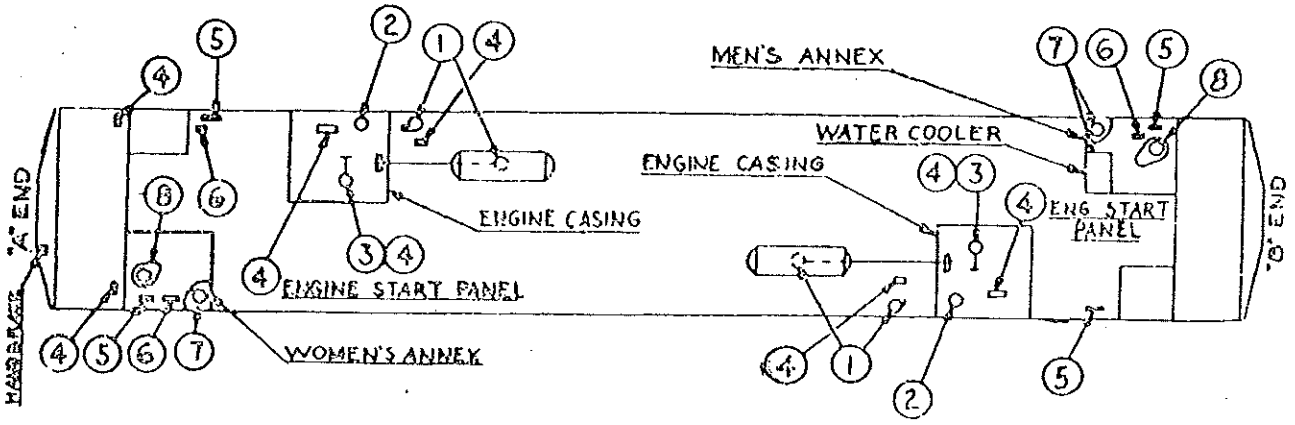
8. FLUSH HOPPERS IN MEN'S & WOMEN'S ANNEX TO COMPLETE SERVICE WATER DRAINAGE.

-- GENERAL --

9. FOR DAILY DRAINING REQUIREMENTS OF OPERATING EQUIPMENT SEE MAINTENANCE CHECK OFF SHEETS.

10. TIME TO FREEZE SCHEDULE - ENGINE COOLING WATER

OUTSIDE TEMPERATURE	TIME REQUIRED
32°F.	7 HOURS
15°F.	5 HOURS
0°F.	3 HOURS
-15°F.	1 HOUR



R.D.C.1

FIG.1
SEC.23

WATER DRAINING INSTRUCTIONS
- UNDERFLOOR -

1. REMOVE PLUGS FROM BOTTOM OF WATER TANK TO DRAIN WATER FROM ENGINE COOLING SYSTEM AND ENGINE WATER JACKETS. OPEN PETCOCKS ON CAR HEAT PUMP & PUMP DISCHARGE PIPE TO DRAIN CAR HEATING SYSTEM.
2. OPEN PETCOCK TO DRAIN WATER FROM ENGINE WATER PUMP INSIDE ENGINE CASING.
3. OPEN DRAIN (EXTENDED HANDLE ON LOWER SIDE OF ENGINE) TO DRAIN WATER FROM OIL COOLER-LOWER PIPE BETWEEN COOLERS.
4. APPLY TAG TO WATER FILL SPUDS AND ENGINE STARTING PANEL AND OIL COOLER DRAIN HANDLES TO INDICATE THAT VALVES ARE OPEN.

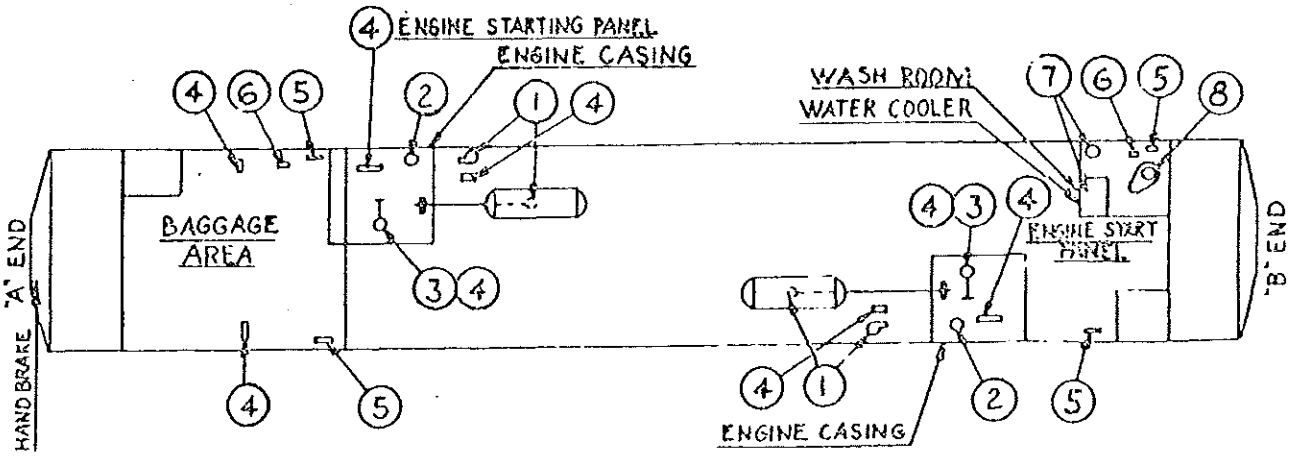
- ABOVE FLOOR -

5. OPEN COCKS ABOVE FLOOR IN WASH ROOM, UNDER REMOVABLE SEAT & IN BAGGAGE AREA TO COMPLETE DRAINAGE OF RADIATION.
6. OPEN COCKS IN WASH ROOM & BAGGAGE SECTION TO DRAIN OVERHEAD TANK.
7. OPEN WASH BASIN FAUCET AND WATER COOLER FAUCET.
8. FLUSH HOPPER IN WASH ROOM TO COMPLETE SERVICE WATER SYSTEM DRAINAGE.

- GENERAL -

9. FOR DAILY DRAINING REQUIREMENTS OF OPERATING EQUIPMENT SEE MAINTENANCE CHECK-OFF SHEETS.
10. TIME TO FREEZE SCHEDULE

OUTSIDE TEMPERATURE	ENGINE COOLING WATER TIME REQUIRED
32°F.	7 HOURS
15°F.	5 HOURS
0°F.	3 HOURS
-15°F.	1 HOUR



R. D. C. 2

FIG. 2
SEC 23

WATER DRAINING INSTRUCTIONS
- UNDERFLOOR -

1. REMOVE PLUGS FROM BOTTOM OF WATER TANK TO DRAIN WATER FROM ENGINE COOLING SYSTEM AND ENGINE WATER JACKETS. OPEN PET COCKS ON CAR HEAT PUMP & PUMP DISCHARGE PIPE TO DRAIN CAR HEATING SYSTEM.
2. OPEN PETCOCK TO DRAIN WATER FROM ENGINE WATER PUMP INSIDE ENGINE CASING.
3. OPEN DRAIN (EXTENDED HANDLE ON LOWER SIDE OF ENGINE) TO DRAIN WATER FROM OIL COOLER-LOWER PIPE BETWEEN COOLERS.
4. APPLY TAG TO WATER FILL SPUDS AND ENGINE STARTING PANEL AND OIL COOLER DRAIN HANDLES TO INDICATE THAT VALVES ARE OPEN.

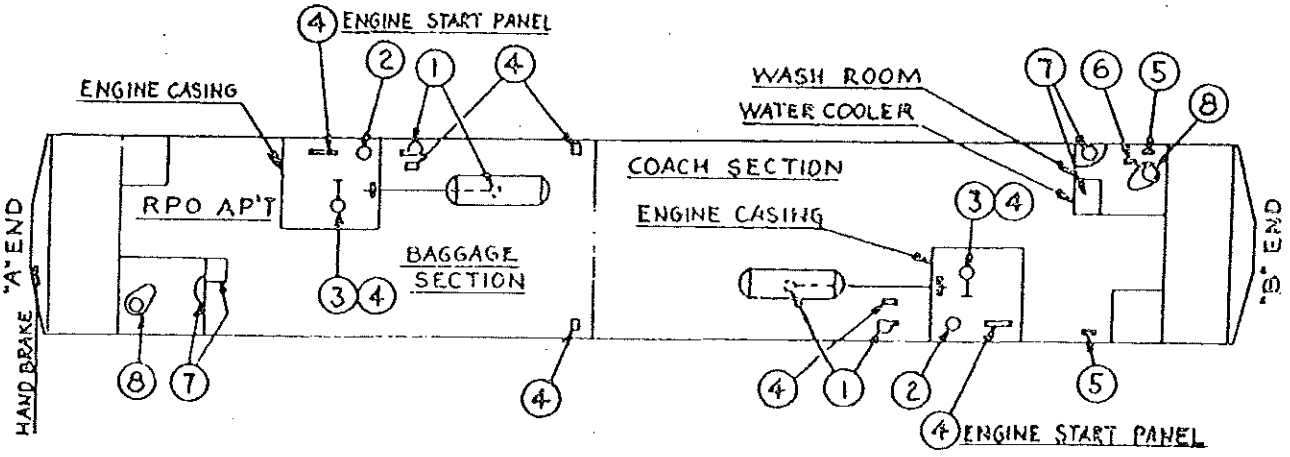
- ABOVE FLOOR -

5. OPEN COCKS ABOVE FLOOR IN WASH ROOM AND UNDER SINGLE PASSENGER SEAT TO COMPLETE DRAINAGE OF RADIATION.
6. OPEN COCK IN WASH ROOM TO DRAIN OVERHEAD TANKS.
7. OPEN WASH BASIN FAUCETS AND WATER COOLER FAUCETS.
8. FLUSH HOPPERS IN WASH ROOMS TO COMPLETE SERVICE WATER SYSTEM DRAINAGE.

- GENERAL -

9. FOR DAILY DRAINING REQUIREMENTS OF OPERATING EQUIPMENT SEE MAINTENANCE CHECK-OFF SHEETS.
10.

TIME TO FREEZE SCHEDULE OUTSIDE TEMPERATURE	ENGINE COOLING WATER TIME REQUIRED
32°F.	7 HOURS
15°F.	5 HOURS
0°F.	3 HOURS
-15°F.	1 HOUR



R.D.C. 3

FIG.3
SEC.23

WATER DRAINING INSTRUCTIONS
- UNDERFLOOR -

1. REMOVE PLUGS FROM BOTTOM OF WATER TANK TO DRAIN WATER FROM ENGINE COOLING SYSTEM AND ENGINE WATER JACKETS. OPEN PET COCKS ON CAR HEAT PUMP AND PUMP DISCHARGE PIPE TO DRAIN CAR HEATING SYSTEM.

2. OPEN PETCOCK TO DRAIN WATER FROM ENGINE WATER PUMP INSIDE ENGINE CASING.

3. OPEN DRAIN (EXTENDED HANDLE ON LOWER SIDE OF ENGINE) TO DRAIN WATER FROM OIL COOLER LOWER PIPE BETWEEN COOLERS.

4. APPLY TAGS TO WATER FILL SPUDS AND ENGINE STARTING PANEL AND OIL COOLER DRAIN HANDLES TO INDICATE THAT VALVES ARE OPEN.

- ABOVE FLOOR -

5. IN R.P.O. TOILET OPEN FAUCETS ON WASH BASIN AND WATER COOLER. REMOVE PLUGS FROM HOT AND COLD WATER LINES UNDER WASH BASIN AND FLUSH HOPPER.

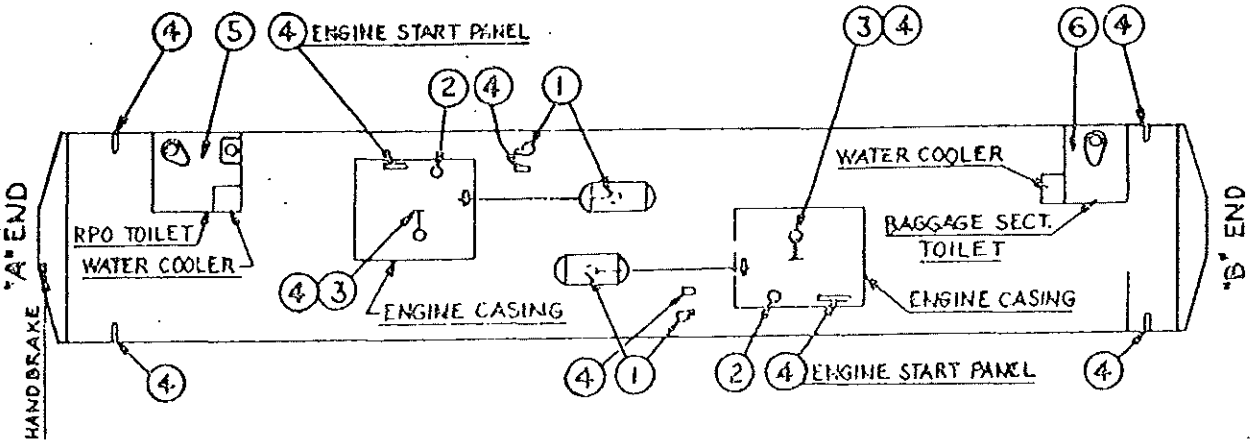
6. IN BAGGAGE SECTION TOILET - OPEN FAUCETS ON FOLDING WASH BASIN AND ON WATER COOLER AND FLUSH HOPPER.

- GENERAL -

7. FOR DAILY DRAINING REQUIREMENTS OF EQUIPMENT SEE MAINTENANCE CHECK OF SHEETS.

8. TIME TO FREEZE SHCEDULE

OUTSIDE TEMPERATURE	ENGINE COOLING WATER TIME REQUIRED
32°F.	7 HOURS
15°F.	5 HOURS
0°F.	3 HOURS
-15°F.	1 HOUR



R. D. C. 4

FIG. 4
SEC. 23

WATER DRAINING INSTRUCTIONS
— UNDERFLOOR —

1. Remove plugs from bottom of water tank to drain water from engine cooling system and engine water jackets. Open pet cocks on car heat pump and pump discharge pipe to drain car heating system.

2. Open pet cock to drain water from engine water pump inside engine casing.

3. Open drain (extending handle on lower side of engine) to drain water from oil cooler - lower pipe between coolers.

4. Apply tag to water fill spuds and engine starting panel and oil cooler drain handles to indicate that valves are open.

- ABOVE FLOOR -

5. Open cocks above floor in general toilet and under removable seats to complete drainage radiation.

6. Open cocks in general toilet and under removable seat ('A' end) to drain overhead tank.

7. Open annex basin faucets and water cooler faucet.

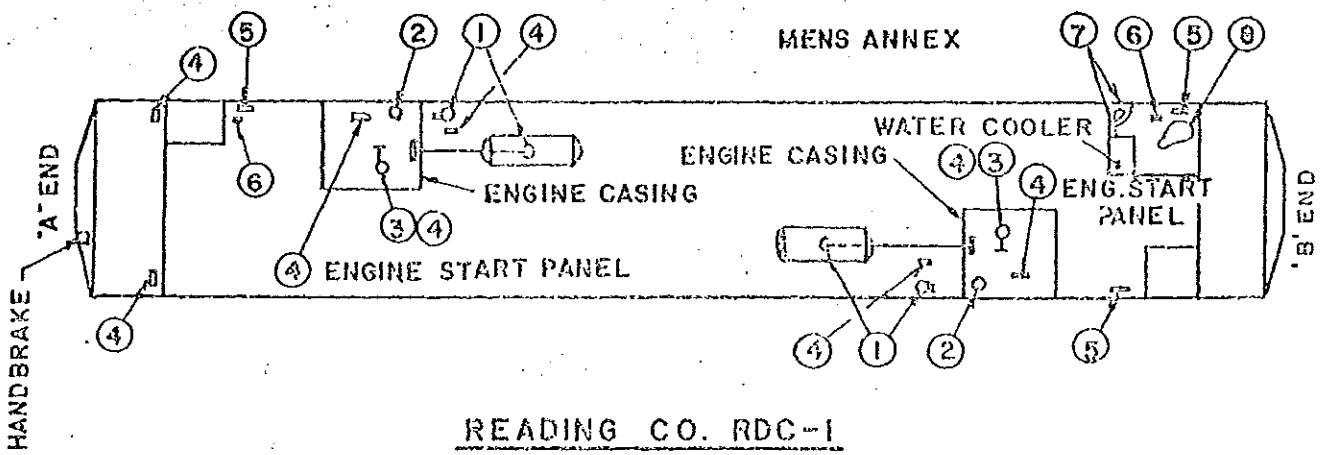
8. Flush hopper in general toilet to complete service water drainage.

- GENERAL -

9. For daily draining requirements of operating equipment see maintenance check-off sheets.

10. Time to Freeze Schedule-Engine Cooling Water

Outside Temperature	Time Required
32°F.	7 Hours
15°F.	5 Hours
0°F.	3 Hours
-15°F.	1 Hour



READING CO. RDC-1

FIG. 5
SEC. 23

SECTION 24

CAR CLEANERS

Cleaners for use on the exterior of Budd stainless cars should be those that are basically sodium acid sulfate and/or oxalic acid. These however must be free from chlorides or other harmful chemicals.

Cleaners as manufactured by the following companies are recommended by The Budd Company:

C&H Chemical Co.
Railway Division
475 N. Cleveland Ave.
St. Paul 4, Minn.

Magnuson Products Corp.
50 Court Street
Brooklyn 1, N.Y.

Turco Products, Inc.
6135 S. Central Ave.
Los Angeles 1, Cal.

Kelite Products, Inc.
1250 N. Maine Street
Los Angeles 1, Cal.

Wyandotte Chemicals Corp.
Wyandotte, Mich.

Dearborn Chemical Co.
Merchandise Mart Plaza
Chicago 54, Ill.

Magmus Chemical Co.
Railway Division
94 South Ave.
Garwood, N.J.

Oakite Products, Inc.
19 Rector Street
New York 6, N.Y.

Pennsylvania Salt Mfg. Co.
486 Widner Bldg.
Philadelphia 7, Pa.

The Bird-Archer Co.
400 Madison Ave.
New York 17, N.Y.

Abisol Products Co.
Forestville, Conn.

Dubois Co.
1120 W. Front St.
Cincinnati, Ohio

Wilson-Imperial Co.
115 Chestnut Street
Newark 5, N.J.

Production designation, concentration and other information pertaining to method of application should be obtained from the respective supplier.

In every case however, thorough water rinsing must immediately follow the solution cleaning.