EMD MAINTENANCE INSTRUCTION

MODERNIZATION RECOMMENDATION

REDUCED MAINTENANCE TRACTION MOTOR GEAR CASE

PURPOSE: The reduced maintenance gear case contains improved sealing to minimize the amount of lubricant leakage, and incorporates reservoirs in the gear to increase the lubricant capacity of the gear case. These improvements when combined with the application of narrow window type support bearings, will permit operation of the locomotive for a minimum of 30 days without underneath attention and servicing. Some extension of lubrication periods may be expected when the reduced maintenance gear cases with gutters are used, even when the gears do not have the reservoirs.

APPLICATION: All lower and upper offset type gear cases. All gears except the G.E. type that have a spider on both sides forming a box section.

REFERENCE: Maintenance Instruction 9523 and drawings shown in this instruction.

NEW MATERIAL REQUIRED:

Part No.	Qty.	Description	Price
GEAR CASE			
8316960	1	KIT .. Removable Gutter	$ 7.95
8315280	1	GUTTER .. Wheel Side	
8315281	1	GUTTER .. Gear Hub	
8301380	2	RETAINER .. Gutter	
8315259	2	SHIM .. .060"	
8315334	1	DEFLECTOR .. Splash	
8306090	1	PLATE .. Caution	
8316959	1	KIT .. Removable Gutter Retainer Pads	.20
8077940	4	PAD	
8316958	1	KIT .. Felt Seal Stop Pads	.12
8250229	2	PAD	
8250403	2	PAD	
8315282	1	KIT .. Filler Cap Opening	13.15
8315260	1	FILLER .. Opening and Segment Assy.	
8245803	1	CAP ASSEMBLY	
8310818	1 lb. ball	GASKET CORD	

Retainer Ring Part No.	Qty.	Axle Gear Application Number of Teeth	Price Each
ONE PIECE GEARS			
8306153	2	52T	$ 5.20
8306156	2	55T, 56T and 57T	5.20
8306154	2	58T and 59T	5.20
8299513	2	60T, 61T and 62T	5.20
8306155	2	65T	6.25
TWO PIECE GEARS WITH "I" CENTER SECTION			
8322590	2	59T, 60T, 61T, 62T and 65T	5.20

Modification of the upper gear case will require one removable gutter kit 8316960 and one each of part 8250229 and 8250403 felt seal stop pads.

Modification of the lower gear case will require one removable gutter retainer kit 8316959 and one each of part 8250229 and 8250403 felt seal stop pads.

Modification of the axle gear will require two of the retainer rings as specified for each particular gear in Table 2.

Filler cap kit 8315282 will be needed for lower and upper half gear cases that do not contain filler openings.

COST OF NEW MATERIAL: The prices listed under New Material Required are to be used for job estimation purposes only and not as specific cost of material. Specific prices will be furnished by our Parts Department on request and will be subject to prices in effect at time of material shipment.

PROCEDURE

GEAR CASE - UPPER HALF

Only gear cases with numbers listed in Table 1 can be modified to accept the removable gutter. The gear cases should be in good condition and mounting pads should not have more than .020" wear from being loose on the support arms.

1. Clean the gear case.
2. Remove the gutters from over the axle openings on both sides of the gear case, refer to Fig. 1. Do not remove the gutter which is over the pinion opening. On early model gear cases having a one piece gutter and seal retainer, the gutter must be removed by machining with a fly-cutter, Fig. 1. Remove all burrs and burning slag from the area where gutters were removed.
3. Locate one .060" shim, 8315259 over the gear hub side, Fig. 2. Place gutter retainer 8301380 on top of the shim so the I.D. of the gutter retainer is flush with the I.D. of the shim. Check to see that the gutter retainer and shim are equally spaced radially from I.D. of the felt seal retainer, or 7-9/16" from center line of axle. Use "C" clamps to pull the retainer and shim down tight against the gear case side plate for welding.

4. Grind off any weld material protruding from the parting line around the felt seal retainers, or above the channel opening of the gutter retainer, as it will prevent the removable gutter from sliding in and dropping out properly.

5. Make sure the gutter retainer and shim are tight against the side of the case. Tack weld the gutter and shim to the side of the case at 3 or 4 spots. Do not tack weld on the I.D. of assembly as the weld splatter and weld can cause the gutter to bind in the retainer.

6. Remove the "C" clamps and provide an oil tight weld around the O.D. of the gutter retainer and shim. Backstep the weld to hold down distortion.

7. Slide the removable gutter 8315280 through the wheel side gutter retainer, and gutter 8315281 through the gear hub side gutter retainer. Gutters have all but one corner bent over to prevent inserting the gutter backwards. Feed the straight corner of the gutter into the retainer from the filler cap end of the gear case. The gutter should slide freely around the retainer until approximately 2" of the gutter remains above the parting line of the case. The last two inches should require tapping with a soft mallet to drive the gutter in flush with the parting line of the case. The tight fit prevents vibration of the gutter, which would cause abnormal wear on the gutter and retainer blocks. To obtain the correct fit, it is necessary to close 1" of the pinion end of the gutter retainers to 3/32". The gutter has a dimple at the filler cap end which wedges the opposite end of the gutter tight in the retainer.

8. Repeat steps 1 through 7 for application of gutter retainer over the wheel hub side. Refer to Fig. 2.

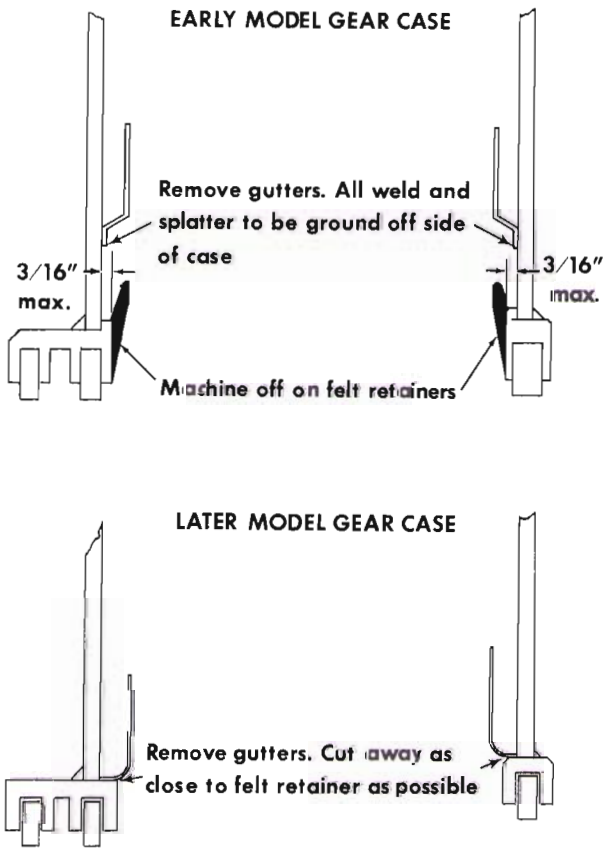


Fig. 1 - Previous Gear Cases

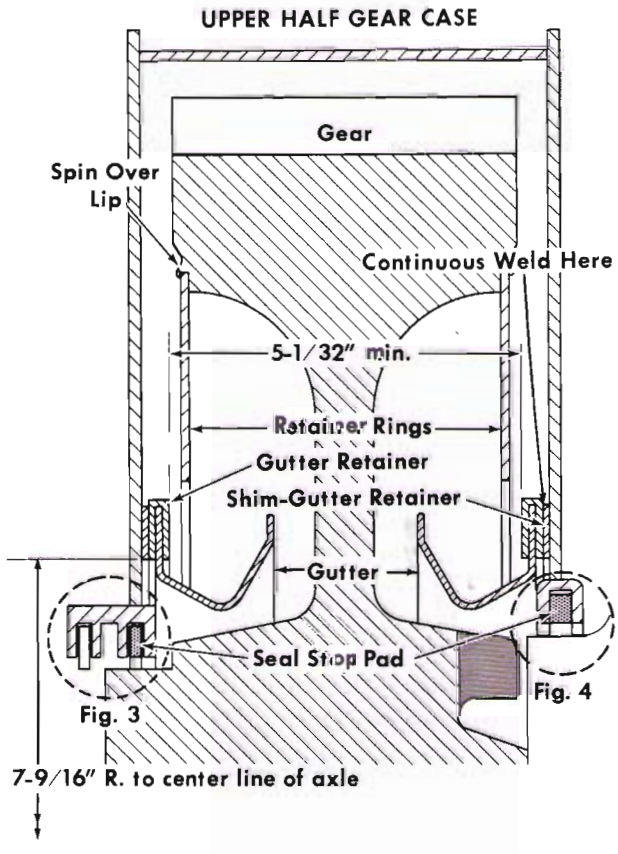


Fig. 2 - Upper Half Gear Case

9. The distance between the two gutter retainers should be 5-1/32" for sufficient gear clearance and to insure proper assembly. Refer to Fig. 2. If the dimension is less than 5-1/32", the gear case will have to be spread apart with jacks. Do not over spread the upper half as the lower case will not fit and the gutter retainers may bow, causing the gutters to bind.

10. All upper half gear cases should be provided with the latest design cap and filler opening. Early model gear cases have a flip open type of cap, which has a tendency to leak with the reduced maintenance design unless the the spring and gaskets are maintained in excellent condition. The latest design filler opening and cap assembly 8315282 can be added to any upper half gear case, Fig. 6. It should be located so that the clamping bolt can be removed without interference from the locking segments on the cap.

11. Locate the center of the filler opening on the gear case band, then cut a 4-1/2" hole through the band.

12. After drilling the 4-1/2" hole, reposition the filler assembly and tack weld the base at the four corners. If an excessive gap is found at the end of the base plate, a filler strip will be required under the plate. Do not bend the edge of the base plate, as it will deform the machined surface on which the filler cap seats. Provide an oil tight weld around the base plate.

13. A caution plate 8306090 is to be welded to the filler cap end of the gear case as shown in Fig. 6. The purpose of the caution plate is to alert maintenance personnel, on assembly, to check the lower gear case for gutter retainer blocks so as to prevent usage of unmodified lower gear cases with removable gutter upper half assemblies.

14. Position the seal stop pads 8250403 and 8250229 in the axle bore seal retainers as shown in Figs. 2, 3, and 4. Weld and grind flush with retainer. Do not recess the pads below the parting line, or the metal back felt seal will protrude on the opposite end. Note that on the motor side, only the inboard retainer receives a stop pad.

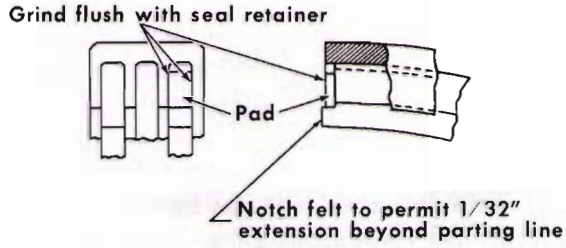


Fig. 3 - Motor Side - Axle Bore Seal Retainers

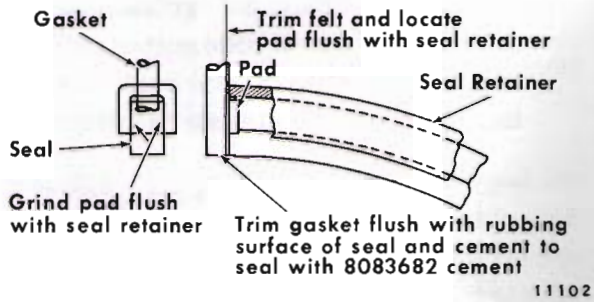


Fig. 4 - Wheel Side - Axle Bore Seal Retainers

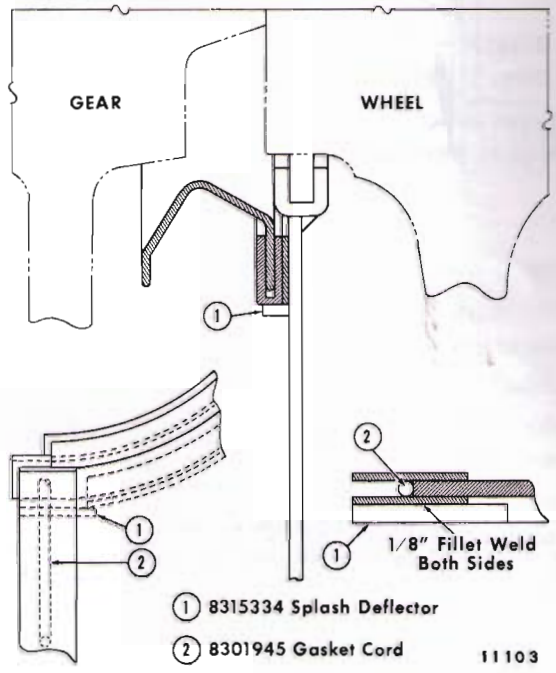


Fig. 5 - Splash Deflector

The purpose of the stop pads is to prevent any rotation of the seals.

15. A splash deflector 8315334 is to be welded to the inside of the case on the wheel side at the pinion end of the gutter retainer, as shown in Fig. 5. Make sure the deflector does not interfere with the assembly of the gutter.

16. Remove all slag and foreign material from inside the gear case and clean thoroughly. Paint all bare metal except the gutters, inside of gutter retainers, and seating surfaces of filler opening and cap.

17. Obliterate the old part number on the side of the case and stamp the new part number, corresponding to the gear ratio size shown in Table 1.

LOWER GEAR CASE MODIFICATION

1. Apply return duct as explained in Maintenance Instruction 9523.

2. Apply gutter retainer pads 8077940 as shown in Fig. 7. The four pads are used to prevent the gutters from rotating out of the retainers in the upper gear case. Position the pads on the splash guard strip and weld across the bottom and at both ends. On some gear cases, the splash guard strip was short and did not extend up close to the seal retainers in the area where pads must be located. Where this exists, a 1/8" thick filler strip will be required between the pad and gear case. Pads must be located 7-3/8" from the centerline of the retainer.

3. If there is no filler cap on the lower gear case, apply 8315282 filler opening and cap assembly. Locate the assembly so the clamping bolt can be removed without interference from the locking segment of the cap. Refer to Fig. 6. Locate the center of the filler opening on the gear case band, mark center, then drill a 4-1/2" hole through

TABLE 1

GEAR CASE UPPER HALF			GEAR CASE LOWER HALF		
Gear Ratio	Old Case No. That Can Be Modified	New Gear Case Part Number	Gear Ratio	Old Case No. That Can Be Modified	New Gear Case Part Number
52/25 55/22 56/21	8250207 8246029 8205588	8301946	52/25 55/22 56/21	8297811 8250208 8246030 8205587	8302645
57/20 58/19 59/18 60/17 61/16 62/15	8250210 8245988 8205251	8301948	57/20 58/19 59/18 60/17 61/16 62/15	8297810 8250211 8245989 8205250	8302644
65/12 65/12 65/12	8250213 8246040 8205586	8301947	65/12 65/12 65/12	8297812 8250214 8246041 8205585	8302646
		MRS-1 & Export Locomotives			
60/17	8250210 8245988 8205251	8301948	60/17	8210062 8246052 8250217	8302647

the band. After drilling the 4-1/2" hole, reposition the filler assembly and tack weld the base at all four corners. If an excessive gap is found at the end of the base plate, a filler strip will be required under the plate. Do not bend the edge of the base plate as it will deform the machined surface on which the filler cap seats. Provide an oil tight weld around the base plate.

4. Apply felt seal stop pads 8250403 and 8250229 to the axle felt seal retainers as shown in Figs. 7 and 9. Weld the stop pads in the seal retainers on the side toward the pinion. After pads are welded, they should be filed or ground smooth with the top of the seal retainer. Fig. 9 shows how to trim the felt seals, when they are applied to the retainers.

5. Remove all slag and foreign material from inside the gear case, clean and paint all bare metal.

6. Obliterate the old part number on the side of the case and stamp the new part number corresponding to the gear case ratio shown in Table 1.

GEAR MODIFICATION

All one piece and most two piece gears can be modified to accept the reservoir assemblies.

1. It will be necessary to remove the gear from the axle for machining and for the application of the two ring retainers.

2. Referring to Fig. 8, machine both sides of the gear rim. Table 2 shows the "A" dimension for each individual gear ratio, and part number for the exact ring retainer to be applied. Machine off the metal above the stress groove on the wheel side of the gear hub.

3. Insert the ring retainer in the gear and spin a metal lip over the edge of the ring, using a rolling tool. Refer to Fig. 10, which shows all details for

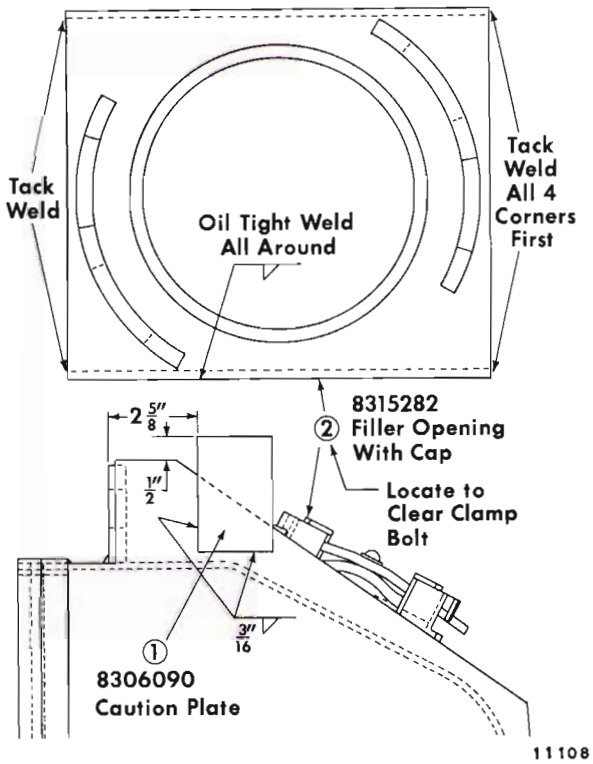


Fig. 6 - Filler Cap Application

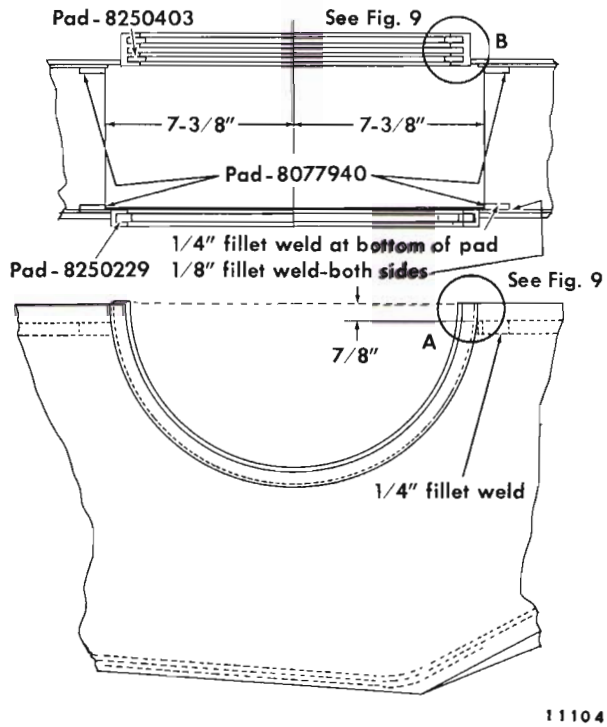


Fig. 7 - Lower Half Case

TABLE 2

Gear Part No.	Number Of Teeth	Ring Retainer Part No.	New Gear With Reservoir Assm. Part No.	Dimension "A" Figure 8	Dimension "B" Figure 8
ONE PIECE GEARS					
8184332	52	8306153	8306157	19.567*	19.442
8184342	55	8306156	8306161	20.942*	20.818
8184396	56	8306156	8306160	20.942*	20.818
8184325	57	8306156	8306162	20.942*	20.818
8184378	58	8306154	8306158	22.130*	22.005
8184333	59	8306154	8306159	22.130*	22.005
8179295	60	8299513	8306165	23.500*	23.375
8184341	61	8299513	8306164	23.500*	23.375
8109579	62	8299513	8299512	23.500*	23.375
8178812	65	8306155	8306163	25.130*	25.005
TWO PIECE GEARS					
8055048	55	Alteration	New		
8089112	56	Not	Two-Piece		
8090455	57	Recommended	Gears Not		
8059058	58		Available		
8054558	59	8322590		21.375*	21.250
8115601	60	8322590		21.375*	21.250
8060542	61	8322590		21.375*	21.250
8024871	62	8322590		21.375*	21.250
8034616	65	8322590		21.375*	21.250

*± .005

fabricating a suitable tool. The lip should be at least 1/32" thick and extend over the retainer ring a minimum of 1/16". The inside diameter of the rolled lip should be held as close as possible to the "B" dimension of Table 2 and Fig. 8. Do not apply excessive pressure on the lip as it will flatten and weaken the lip and cause the retainer ring to dish out and extend beyond the gear. Should this happen, it may be corrected by moving the rolling tool to the inside diameter of the ring and applying pressure perpendicular to the side plate. This will force the lip open slightly and relieve the dishing force. Apply ring retainer to the opposite side in the same manner.

4. Remove all metal chips and clean the gear reservoir before the gear is applied to the axle.

APPLICATION AND DISASSEMBLY INSTRUCTIONS

Narrow window traction motor support bearings are recommended for use with the reduced maintenance gear case, as there is less purging of axle cap oil at the flange of the bearing than from the wide window bearing. If wide window bearings are used, the oil level in the axle cap must not exceed 5-1/2" to prevent excessive oil splash at the window and possible dilution of gear case lubricant.

As the removable gutters extend into the gears, special assembly practices are necessary. The gear case should be clean. The channels at the parting lines as well as those for the felt seals should not be damaged or closed in since this would cause interference at assembly.

The upper and lower halves of the gear cases should be assembled and

checked for fit before attempting installation in the truck.

1. Apply the return duct gasket to the traction motor pinion end drain slot with adhesive. Remove the lockwasher from the lower pinion end housing bolt to provide assembly clearance for the return duct on the lower gear case. Refer to M.I. 9523 for procedure.

2. New metal back felt seals should be installed and the felt trimmed as shown in Figs. 3, 4 and 9. A gasket cord 8310818 should be wedged into the parting line channel of the upper gear case, as shown in Fig. 4, and cemented at the ends using cement 8083682 or Permatex.

3. Remove the gutters from the upper half of the gear case and apply the upper half in the normal manner.

NOTE: The gutters are different for each side and are not reversible. Gutter 8315281 is used on the gear hub side and 8315280 on the wheel hub side. All corners except one have been bent over to prevent improper application; there is also a dimple on the engaging surface. The straight edge as well as the dimple can be used to identify the wheel side and motor side when the part number is obliterated. The dimpled end should be toward the filler cap end of the case when applied, with the dimple next to the side of the case, and not to the gear side.

4. The removable gutters are then rolled in place by inserting the straight edge of the gutter into the gutter retainer. A light oil film placed on the gutter will facilitate the application. The gutter is first fitted inside the gear at the bottom and then rotated into the channel retainer. As the gutter nears the final location, the fit should be snug and will require tapping with a mallet to position the gutter flush with parting line of upper half gear case.

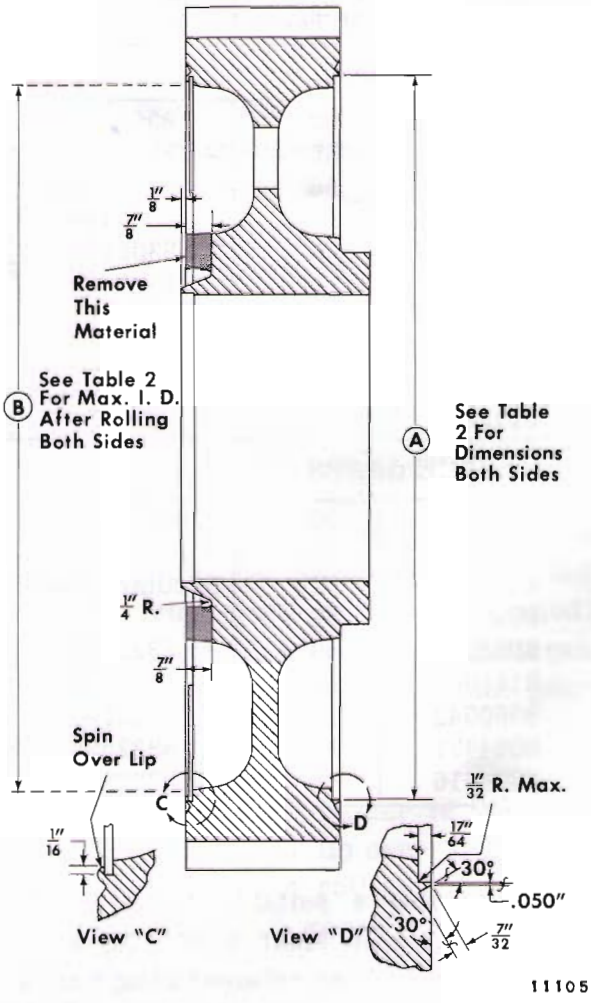


Fig. 8 - Gear Modifications

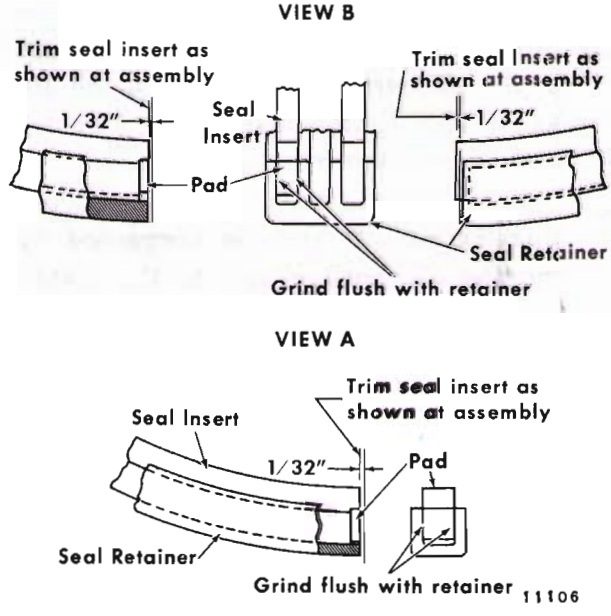


Fig. 9 - Felt Seal Stop Pads

NOTE: Wheel hubs must be machined as shown in Fig. 11 for necessary clearance to apply gutter inside the gear, and to prevent interference between wheel side seal retainer and wheel hub.

5. The lower half of the gear case is then applied in the normal manner. Check to see that return duct gasket did not shift on the motor during assembly. New tee head clamping bolts 8322027 are then applied, using elastic stop nut 8032750 and new flat washer 8322026, to prevent the gear cases from working loose. In order to provide assembly clearance for the tee head bolt, the lower filler cap retaining segment on the upper half must have two corners removed as shown in Fig. 12.

6. Torque clamping bolts 425 to 450 foot-pounds. Twelve pounds of Sinclair Jet Lube TM, or equivalent, is recommended for the initial charge during assembly of the lower gear case, or after final assembly, depending on convenience.

7. Standard gear case removal practice can be employed in removing the gear case. The removable gutters do not have to be rolled out as they will drop out when the upper gear case is lifted off.

8. It is a good practice to keep the same upper and lower half cases paired up. Some method of identification should be used when cases are removed.

MAINTENANCE INSTRUCTIONS

1. A new maintenance schedule should be established for units equipped with the reduced maintenance gear case. Although extended performance can be expected, operation mileage will have to be determined by each individual railroad. It is recommended that monthly inspections be made to determine condition and level of lubricant.

2. When the reduced maintenance gear case is used with a modified gear, an initial charge of twelve pounds of lubricant is used. When the reduced maintenance gear case is used with a gear that

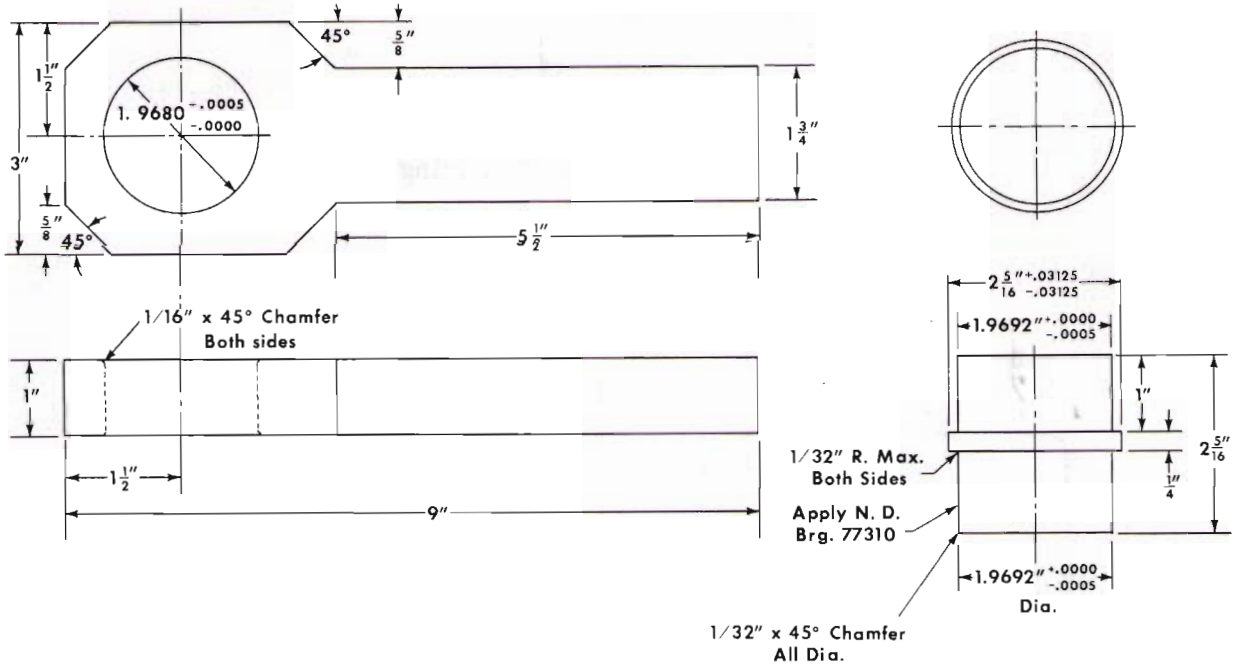
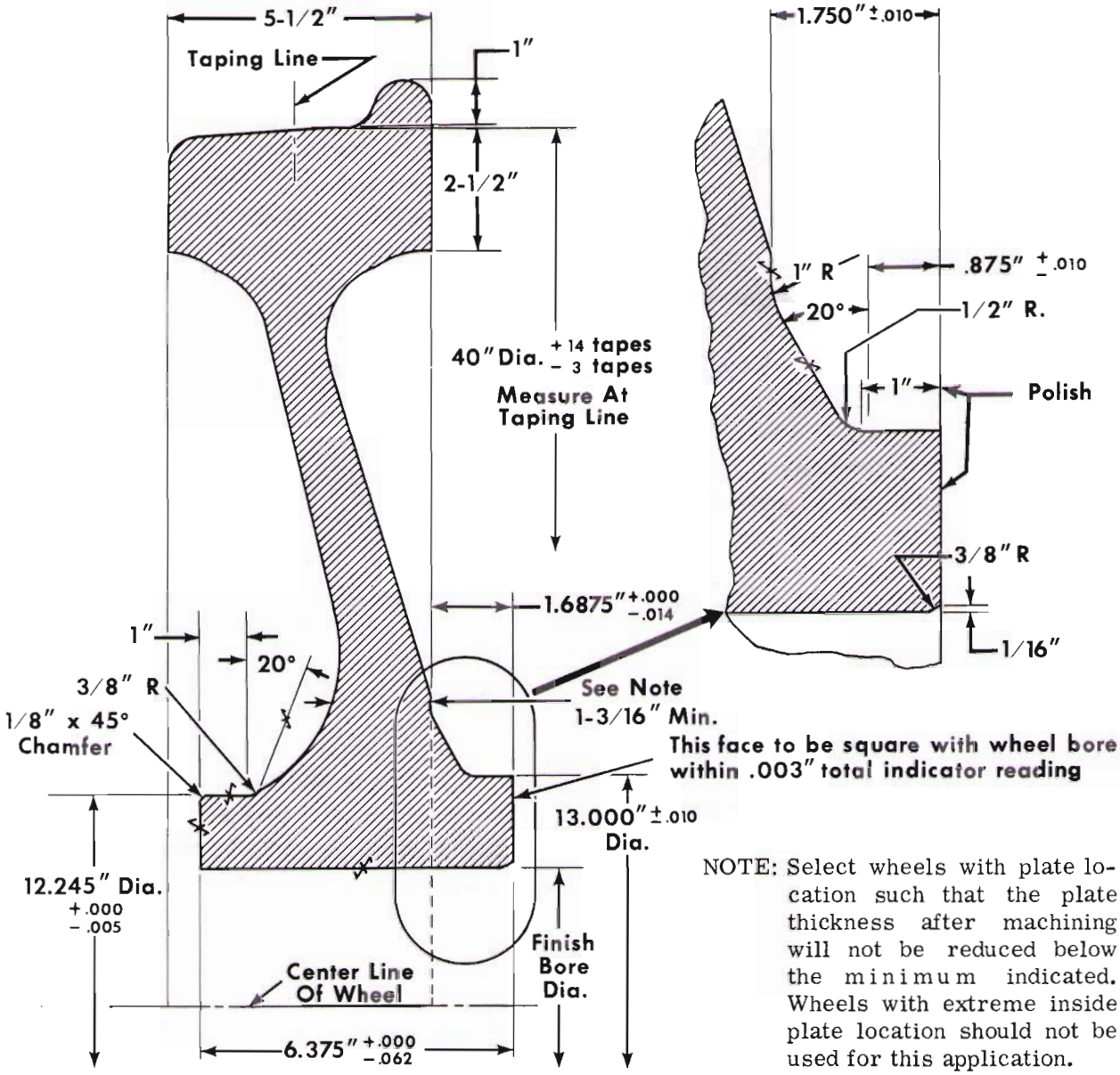


Fig. 10 - Rolling Tool



NOTE: Select wheels with plate location such that the plate thickness after machining will not be reduced below the minimum indicated. Wheels with extreme inside plate location should not be used for this application.

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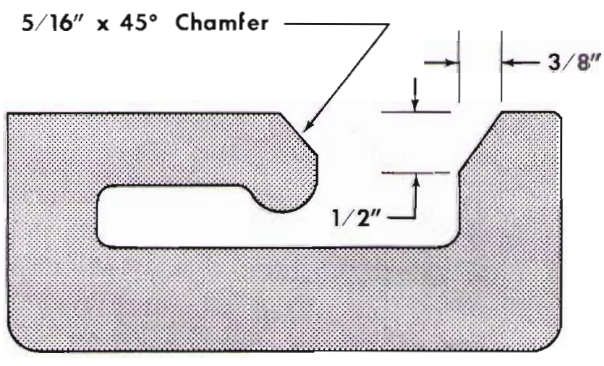
Fig. 11 - Wheel Hub Machining



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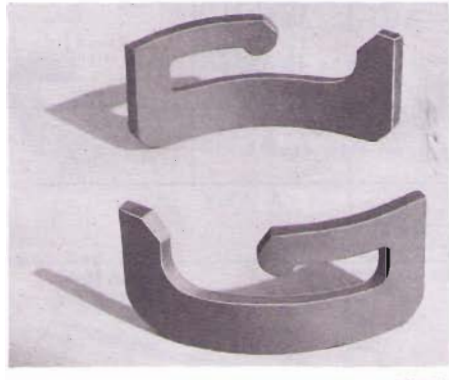

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Fig. 12 - Retaining Segment Rework

has not been modified, an initial charge of ten pounds of lubricant is used. Table 3 shows, for specific gear ratios, the minimum lubricant operating levels allowable. When the minimum level is reached, two pounds of lubricant should be added. In other words the minimum values shown are safe operating levels. This represents a 1/4" tooth dip into the lubricant, which is more than adequate for good lubrication due to the sloshing action that occurs during operation.

3. Run the locomotive over a pit as soon as possible after coming in off a run while the gear cases are hot. Allow the unit to sit for at least fifteen minutes to permit the lubricant to drain to the bottom of the case before checking the level. Since it is hard to accurately measure this level, good judgement must be exercised as to when more lubricant is necessary. Do not overfill, as this in addition to being wasteful, can cause purging with subsequent permanent damage to the seals.

TABLE 3

RECOMMENDED MINIMUM OPERATING LEVEL

Large Case 8301947 Upper 8302646 Lower		Medium Case 8301948 Upper 8302644 Lower		Small Case 8301946 Upper 8302645 Lower	
Gear Ratio	Level	Gear Ratio	Level	Gear Ratio	Level
65/12	9/16"	62/15	11/16"	57/20	5/8"
		61/16	7/8"	56/21	13/16"
		60/17	1-1/8"	55/22	1"
		59/18	1-3/8"	52/25	1-11/16"
		58/19	1-5/8"		
		57/20	1-13/16"		
		56/21	1-15/16"		

Litho in U.S.A.