SECTION 5-C
REAR AXLE REPAIR PROCEDURES

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SERVICE BULLETIN REFERENCE

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5-7 INTRODUCTION

a. Arrangement and Use of This Section

This section contains procedures for repair or replacement of all internal components of the rear axle assembly except the brakes. The procedures are arranged in the progressive order that should be followed for a complete overhaul of the rear axle.

The procedures should be followed in the order given, to the extent required to accomplish removal, inspection, installation, and adjustment of only those parts that are to be repaired or replaced. Individual procedures are given in separate numbered paragraphs to aid in selecting the particular procedures required when less than a complete overhaul is being performed.

All procedures in this section will be required for replacement of a ring and pinion gear set. These parts are furnished in matched sets only; individual gears are not available. The matched sets are furnished separately and also with the ring gear riveted to a differential case.

b. When to Remove Rear Axle Assembly

On cars equipped with Syncro-Mesh transmissions, it is not necessary to remove the rear axle assembly for any of the repairs outlined in this section; however, these procedures can be used as outlined if the assembly is removed from the car.

The rear axle assembly should be removed from the car before overhaul (par. 5-26) if there is external indication of damage to rear axle or third member housings or strut rods, or if oil is leaking at torque ball or third member flanged joints. These conditions cannot be corrected with the rear axle assembly under the car.

On cars equipped with Dynaflow Drive, it is necessary to remove the rear axle assembly from car whenever the propeller shaft must be removed. The propeller shaft spline oil seal located on front end of propeller shaft (fig. 5-33) cannot be properly installed with third member housing connected to the torque ball.

c. Identification of Removed Parts

When a number of similar parts are removed

that are to be re-installed make certain that they are marked, tagged, or kept separated so that they will be installed in their original positions. This is particularly important in the case of bearings and races, side gears and pinions, their thrust washer, bearing caps and adjusters.

d. Special Tools

Many rear axle parts returned to the factory for credit are damaged as the result of improper methods of removal, indicating that the required special tools were not used. It is reasonable to assume, therefore, that the required special tools are not being used for installation and adjustment of new parts in many cases, with the result that new parts are damaged during installation and for this reason fail to give satisfactory service.

The special tools specified in the procedures covered in this bulletin are absolutely essential to the proper performance of these procedures. They are designed to save time and, of even greater importance, to avoid damage to parts and to insure proper assembly. These special tools should be available to all mechanics who perform rear axle work, and they should be used by the mechanics as specified in the following procedures.

e. Break-In With New Gears

When new gears are installed in a rear axle assembly by the dealer, the car owner must be cautioned to operate the car in the same manner as he would a new car, for a reasonable length of time until the new gears have run in smoothly.

New gears may be scored during break-in by sustained high speed driving, harsh use of clutch causing rear wheels to spin, and by coasting at high speed with clutch disengaged and engaging clutch suddenly.

Do not exceed 50 MPH for the first 500 miles and do not exceed 70 MPH for the second 500 miles.

5-8 REMOVAL OF AXLE SHAFTS

1. Place car stands solidly under rear axle housing so that wheels are clear of floor, then remove rear wheels.

2. Clean the rear end of chassis, bottom of body, axle housing, wheels and tires, and under rear fenders, removing as much dirt as possible. DO NOT TAKE CHANCES OF GETTING ABRASIVE SUBSTANCES INTO AXLE HOUSING OR BEARINGS.

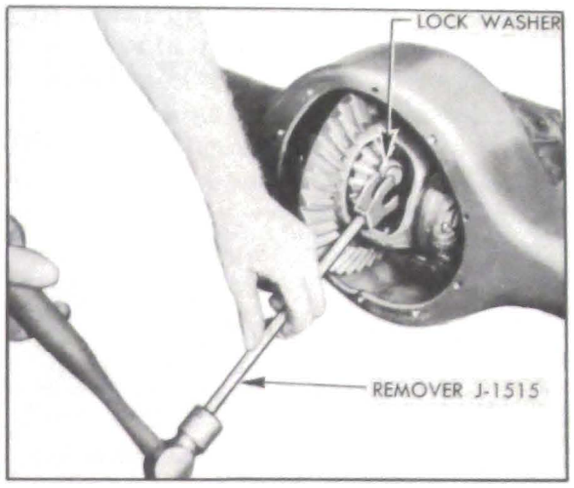


Figure 5-3—Removing Axle Shaft Lock Washer with Remover J 1515

3. Remove cover and drain rear axle housing.

4. Remove differential side pinion shaft lock screw, push pinion shaft from differential case, and remove spacer and pinions.

5. Push each axle shaft inward and drive the horseshoe-shaped lock washer from grooved inner end of axle shaft, using Remover J 1515. See figure 5-3.

6. Support the axle shaft while pulling it out of axle housing to avoid damaging the wheel bearing oil seals. CAUTION: *Do not pull an axle shaft part way out of housing and allow it to rest on oil seals because this will damage seals; always completely remove shaft from housing.*

7. See paragraph 5-25 for installation procedure.

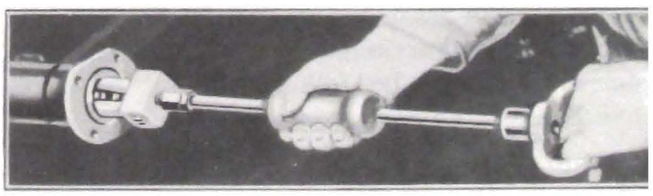


Figure 5-4—Removing Wheel Bearing and Oil Seal with Remover J 1436

5-9 REMOVAL OF WHEEL BEARINGS AND OIL SEALS

1. After removal of axle shaft (par. 5-8), disconnect link from shock absorber arm.

2. Disconnect brake pipe from wheel cylinder and cover openings in pipe and cylinder with plugs or tape to exclude dirt.

3. Remove bolts holding brake backing plate to housing and remove brake assembly. Support brake assembly to prevent injury to the brake cable.

4. Remove outer oil seal and roller bearing, then remove inner oil seal, using Remover J 1436. See figure 5-4.

5. See paragraphs 5-12 and 5-24 for inspection and installation procedures.

5-10 REMOVAL OF DIFFERENTIAL RING GEAR AND CASE ASSEMBLY

1. After removal of both axle shafts (par. 5-8), remove differential side gears and thrust washers from case to prevent them falling out and being damaged.

2. If ring and pinion gear set has been operating quietly and is to be reinstalled, it is advisable to wash lubricant from between gear teeth and check existing gear lash by means of a dial indicator, so that the same lash can be used when parts are reinstalled, to avoid changing gear tooth contact. See paragraph 5-23, steps 8 and 9.

CAUTION: *Backlash will be reduced when pinion is locked by prying up with a bar if there is excessive pinion lift due to worn bearings. See paragraph 5-11, step 2.*

3. *Mark the differential bearing caps so they can be reinstalled in original positions on the carrier.* Interchanging the caps will cause damaged threads because caps are threaded in production while bolted to carrier.

4. Remove bearing adjuster locks, loosen one adjuster, support the differential gear and case assembly while removing bearing caps and adjusters, then lift differential assembly and bearing races out of carrier.

5. See paragraphs 5-12 and 5-23 for inspection and installation procedures.

5-11 REMOVAL AND DISASSEMBLY OF PROPELLER SHAFT AND PINION ASSEMBLY

1. If ring and pinion gear set has been operating quietly and is to be reinstalled, it is advisable to check the pinion setting after removal of differential case (par. 5-10) so that the same setting can be used when parts are reinstalled to avoid changing gear tooth contact. See paragraph 5-21.

2. At this point it may be desirable to test pinion shaft bearing wear without removing pinion shaft. Install 1¼" extension on stem of dial indicator and mount indicator to bear down against center drilling in pinion gear, with indicator stem as near vertical as possible. See figure 5-5. Pry up on pinion gear with bar a number of times while observing indicator reading. A reading in excess of .0015" indicates that bearing is worn enough to produce noisy gear operation.

3. Loosen lock nuts and remove three pinion bearing sleeve lock screws from housing.

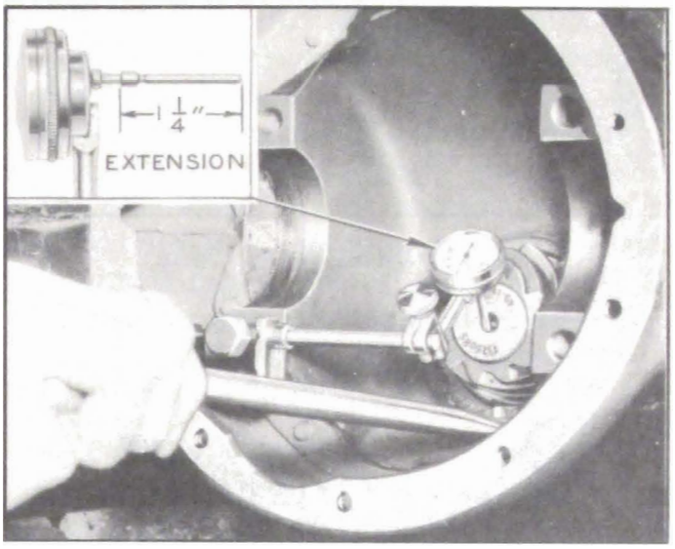


Figure 5-5—Testing Pinion Bearing Wear

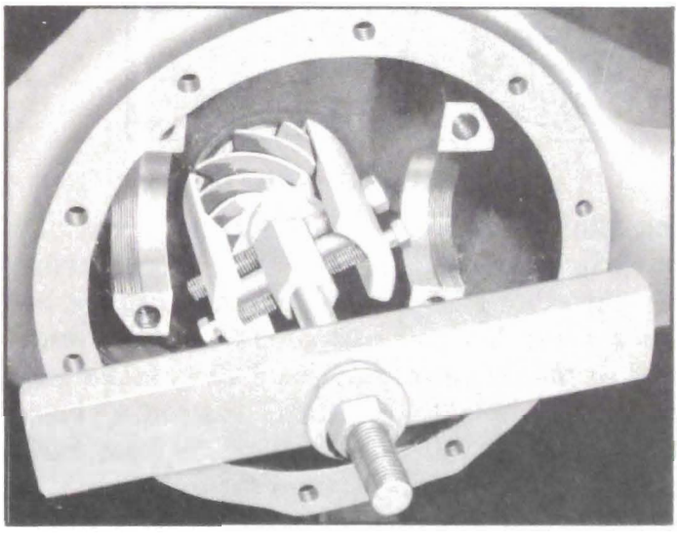


Figure 5-6—Removing Pinion and Propeller Shaft with Puller

4. Pull pinion and propeller shaft assembly rearward out of third member housing, using Pinion Shaft Puller. See figure 5-6.

5. Remove all pinion bearing shims from propeller shaft and third member housing to prevent damage or loss.

6. File or cut off one end of propeller shaft coupling pin and drive out the pin, then pull propeller shaft from pinion using Press J 1292-B. See figure 5-7.

7. Drive up staked section of pinion bearing lock nut with cape chisel and remove nut, grip-

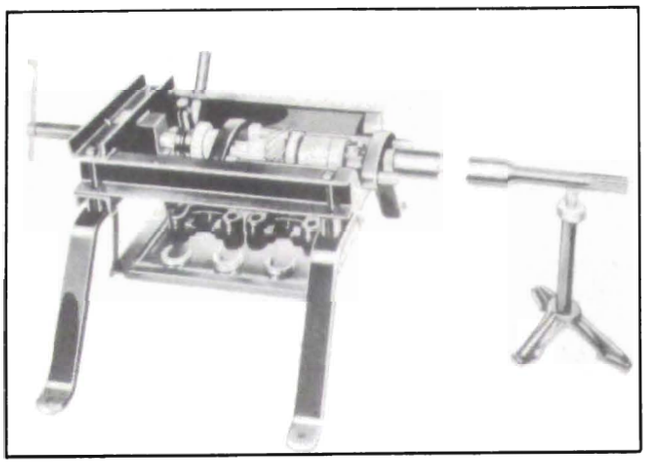


Figure 5-7—Pinion Press J 1292-B

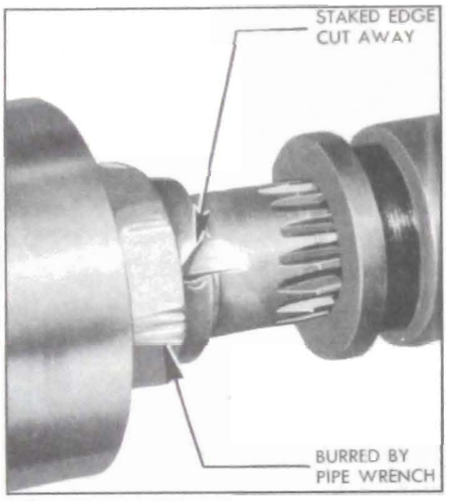


Figure 5-8—Mutilated Bearing Lock Nut

ping pinion shaft on splined end in vise. Do not grip pinion teeth in a vise even though soft jaw liners are used. NOTE: *Figure 5-8 shows a bearing lock nut which has been mutilated so that it is unfit for use. The staked edge has been completely cut away instead of being raised, and the hexagon section has been badly burred by use of a pipe wrench.*

8. Press off pinion front bearing using blocks under outer race of rear bearing, then remove all other parts from pinion shaft. NOTE: *The double-row front bearing is preloaded and normally will have a slight drag when installed on pinion. Do not condemn bearing until inspected as specified in paragraph 1-14.*

9. See paragraphs 5-12 and 5-15 through 5-22 for inspection, assembly, and installation procedures.

5-12 CLEANING AND INSPECTION OF PARTS

Hypoid lubricant is extremely allergic to water and when contaminated with even small quantities of water it has a deteriorating effect on the lubricant. For this reason steam or water should not be used for flushing rear axle assemblies. If used on rear axle parts which are disassembled, extreme care must be used to thoroughly dry all parts before installation.

Gasoline, kerosene, or other distillates are satisfactory for cleaning parts when removed from rear axle housing, if parts are thoroughly dried before installation. They should not be used in an assembled rear axle, however, because if all traces of the cleaner are not removed the fresh lubricant will be contaminated. For this reason, SAE 10-W or flushing oil only is recommended for flushing and cleaning an assembled rear axle.

a. Bearings

Thoroughly clean and inspect all bearings as described under Bearing Service (par. 1-13 & 1-14). Be particularly careful to inspect rear wheel bearings, including inner race on axle shafts, for corrosion caused by rust and for flat spots on rollers.

b. Other Parts

Wash all other parts in clean gasoline or kerosene, and wipe dry with clean cloths. Thoroughly wash out interior of rear axle and third member housings and wipe dry with clean cloths. Blow out all dirt with clean, dry air stream.

c. Gears

Carefully inspect all gears for scores on face of teeth, for chipped teeth and for excessive wear. Examine ring gear and pinion for improper tooth contact. See figure 5-2.

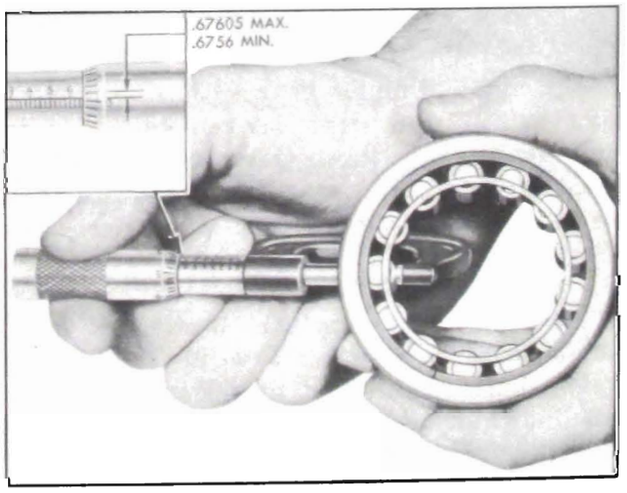


Figure 5-9—Checking Wear of Pinion Rear Bearing

d. Pinion and Rear Bearing

The desired clearance between pinion and the rear (roller) bearing is .0005". The maximum allowable clearance for quiet gear operation is .0014". Excessive clearance at this point is usually caused by wear of the roller bearing.

Wear of the roller bearing may be checked with a micrometer. Before checking, make certain that bearing is absolutely clean and that micrometer is accurate at zero reading. Measure across the outer race and a roller at four or five points around bearing as shown in figure 5-9, using care to adjust micrometer lightly to high points of roller and race to insure an accurate reading. The micrometer will read .6756" to .676" if bearing is satisfactory for use. If reading is less than .6756" the bearing is worn and should be discarded.

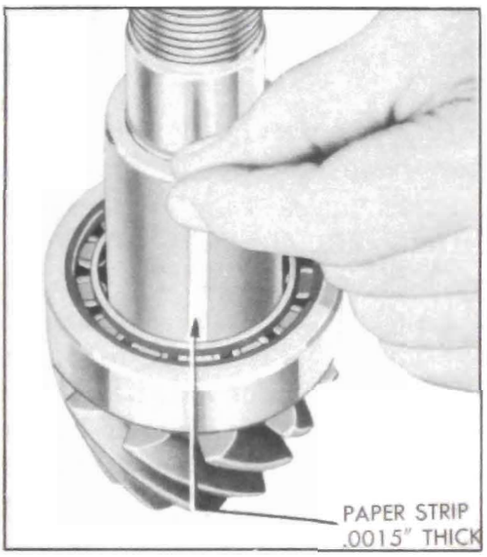


Figure 5-10—Checking Clearance Between Pinion and Roller Bearing

An alternate method of checking clearance between pinion and roller bearing is shown in figure 5-10. Obtain a piece of tough paper, such as typewriter "second" sheet which measures .0015" thick (use micrometer) and cut a test strip 3/16" wide. Place bearing on pinion about 1/4" above spacer, insert paper test strip between two bearing rollers and rotate bearing until strip is under one roller. If clearance is satisfactory, the bearing will hang on the paper strip and the paper strip cannot be pulled out. If bearing drops of its own weight, or paper strip can be easily pulled out, the clearance is excessive and bearing should be discarded.

NOTE: *If roller bearing is worn excessively, it is quite likely that the double-row front bearing is worn so that it no longer has any preload. Inspect this bearing very carefully and discard if loose or doubtful.*

e. Pinion and Propeller Shaft

Check for wear of splines on pinion and in the propeller shaft. Pinion must be a tight fit in propeller shaft when parts are assembled.

f. Rear Axle and Third Member Housings

A sprung housing should be replaced; straightening is not recommended. *A housing must never be heated with a torch as this may produce soft spots in the metal in which fatigue and breakage may develop in service.*

Inspect third member housing for: oil leak at torque ball and at flanged joint between torque tube and carrier; cracked torque tube; strut rod brackets broken or cracked at welds; pinion shaft bearing bores galled or worn due to bearing turning in housing; stripped or damaged threads in side bearing pedestals or caps. See paragraph 5-28 for replacement of housing.

g. Parts Replacement

All parts of rear axle assembly that are excessively worn, scored, chipped, or otherwise damaged should be replaced with new parts to insure quiet operation and satisfactory service after assembly.

Figure 5-11—Removing Differential Bearing Using Puller J 2241

5-13 REPLACEMENT OF DIFFERENTIAL BEARINGS (IF NECESSARY)

1. If a differential bearing is to be replaced, or removed from old differential case and installed on new case, pull bearing from case using Bearing Puller J 2241. See figure 5-11. The ends of puller jaws fit into notches in differential case so that pressure can be applied to bearing inner race. *Do not pull on rollers.*

2. Before installing differential bearing, examine bearing seat on differential case for burrs or scores. Remove high metal with a mill file and coat seat with engine oil or white lead.

Figure 5-12—Installing Differential Bearing Using Replacer J 2242

3. Install bearing, using Replacer J 2242, which is designed to pilot in the case and bear squarely against bearing inner race. See figure 5-12. Bearing must be pressed tight against shoulder on case.

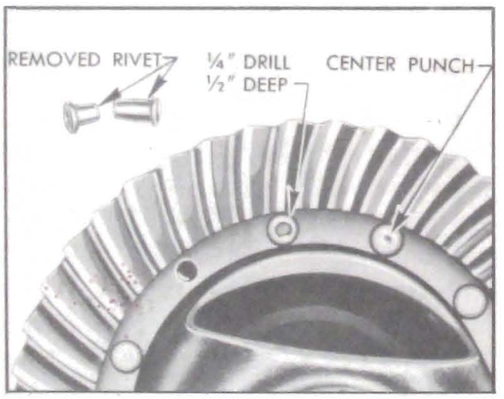


Figure 5-13—Removal of Ring Gear Rivets

5-14 REPLACEMENT OF RING GEAR (IF NECESSARY)

1. Center punch all rivet heads on ring gear side, placing marks in center of heads. Drill rivet approximately ½" deep with ¼" drill. See figure 5-13.

2. While supporting flange of differential case on suitable block, insert punch in drilled hole and drive each rivet out; rivets will be easily parted when driven out. NOTE: *When rivets are installed, they expand more in the softer case than in the harder ring gear. If rivets are drilled and driven out from case side, metal is sheared from surface of rivets by sharp edge of holes in gear. See figure 5-14. This not only makes removal more difficult but will distort the case flange so that a new gear installed on case will not run true.*

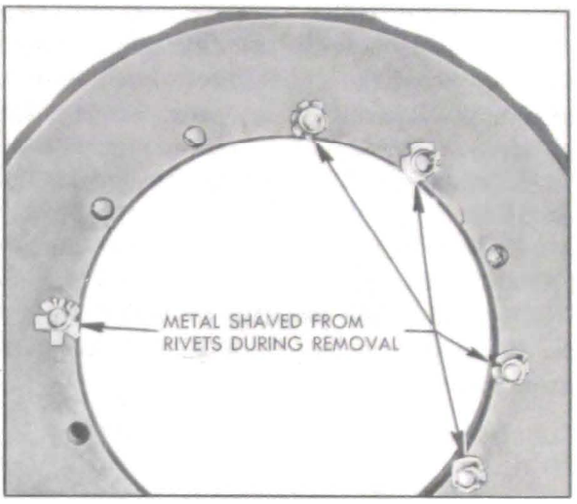


Figure 5-14—Gear Improperly Removed

3. After removal of gear, check machined face of case flange for burrs, particularly around rivet holes. Clean off all burrs with a mill file. Place case in Test Fixture U4-B and check run-out of machined surface of flange with dial indicator. See figure 5-15. Case may be located in fixture upon side bearings as illustrated, or upon bearing seats if bearings are removed from case. If run-out exceeds .002", the flange must be trued up in a lathe to not over .002" run-out.

4. Check matching numbers on new ring gear and pinion to make sure the two parts

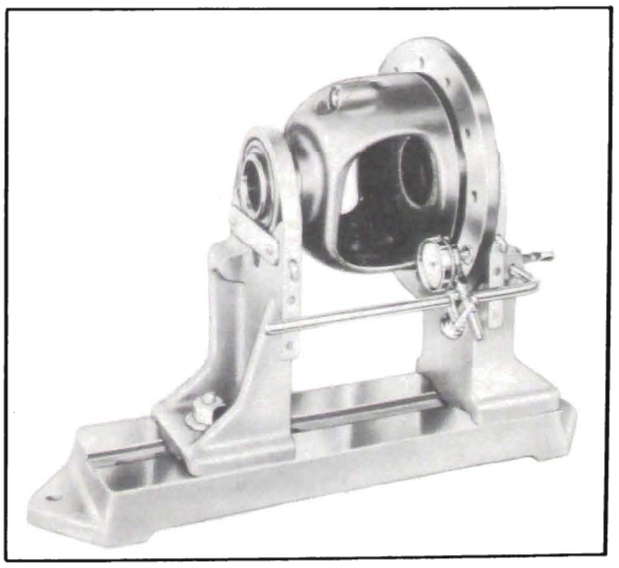


Figure 5-15—Checking Run-Out of Case Flange in Fixture U 4-B

have not been mixed with another gear set. See figure 5-23.

5. After making sure that surfaces of case flange and ring gear are clean and free of burrs, bolt gear to case using eleven (11) 5/16" x 1½" bolts with 3/8" SAE nuts placed in rivet hole counterbores to act as spacers. CAUTION: *It is very important to have these parts bolted tight together. Do not use washers over rivet hole counterbores since they will bend and permit parts to separate slightly during riveting operation.*

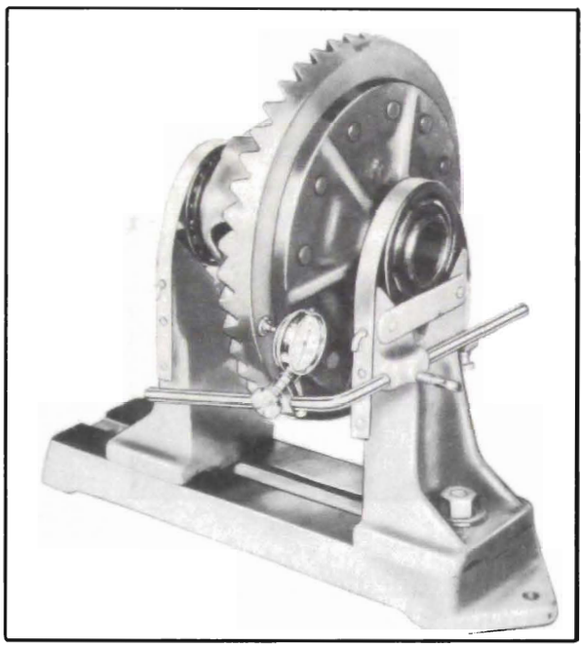


Figure 5-16—Checking Run-Out of Ring Gear in Fixture U 4-B

6. Place bolted assembly in Test Fixture U4-B and check run-out of back side of gear. See figure 5-16. If run-out exceeds .003", check for burrs, uneven bolting condition, or distorted case flange.

7. Place bolted assembly in Riveting Jig J 2196-A with case flange up. See figure 5-17. Use only new rivets of correct part number, which allow 51/64" of shank for heading. Install rivet in the one open hole from gear side and securely head it up cold, which requires a pressure of eight (8) tons. CAUTION: *Excessive pressure may cause rivet to squeeze out between gear and case flange, thereby distorting these parts. Never heat rivets to facilitate heading because hot rivets shrink and become loose in holes during cooling, furthermore, the heads may crack off.*

8. Remove bolt diametrically opposite new rivet and install another rivet in like manner. Finish riveting by working back and forth across gear, using even pressure on all rivets; *do not* install rivets consecutively around gear as gear may be drawn to one side and run eccentric.

9. After all rivets are installed, recheck for run-out at back of gear. See figure 5-16. Run-out must not exceed .003".

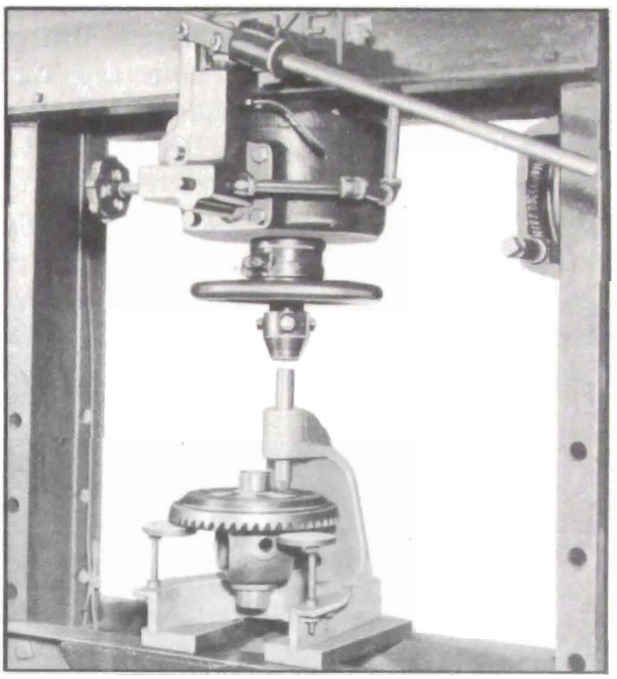


Figure 5-17—Riveting Ring Gear to Case in Riveting Jig J 2196-A

5-15 ASSEMBLY OF PINION, BEARINGS AND PROPELLER SHAFT

1. Install parts on pinion shaft in the following order: rear bearing spacer, rear bearing (roller), bearing lock sleeve with thick end toward spline, front bearing (ball) with shielded side toward spline. See figure 5-18. *Press* front bearing solidly against shoulder on pinion shaft, using a tube of proper size to bear against inner race only. NOTE: *Bearing may be brinnelled if driven into place.*

2. Install bearing lock nut with thin side toward spline. While gripping splined end of

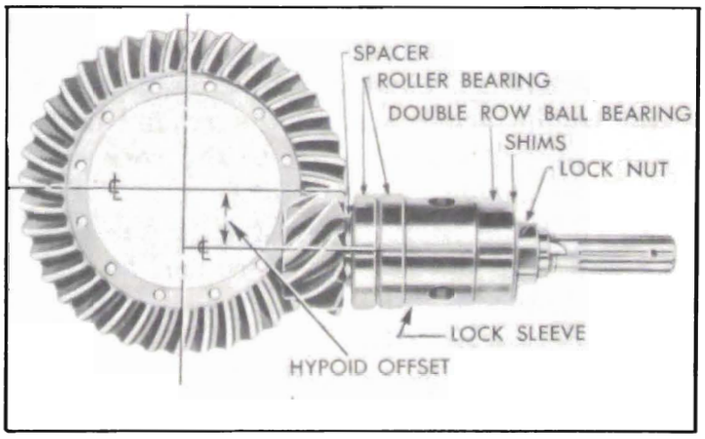


Figure 5-18—Gear Set with Bearings and Lock Sleeve—1949 Model

pinion in vise, tighten nut to a minimum of 150 ft. lbs. torque; nut must hold bearing tight against shoulder on pinion. Do not grip pinion teeth in vise even though soft jaw liners are used. Stake thin edge of nut down into notch in pinion.

3. Coat splines of pinion and propeller shaft with white lead, then press pinion into propeller shaft until coupling pin holes are aligned, using Press J 1292-B. See figure 5-7. Pinion must not be a loose fit in propeller shaft. Install a new coupling pin and solidly rivet both ends.

IMPORTANT: *Whenever a pinion and propeller shaft are assembled together the complete assembly must be checked for straightness regardless of whether new or original parts are assembled. See paragraphs 5-16 and 5-17 below.*

5-16 STRAIGHTENING PINION AND PROPELLER SHAFT ASSEMBLY, USING FIXTURE

The pinion and propeller shaft assembly may be quickly and satisfactorily checked and straightened by means of the fixture shown in figure 5-19. This fixture should be made locally, using any 1940 through 1949 model Buick differential carrier, as shown in figure 5-20.

1. Mount the pinion and propeller shaft assembly in the fixture, being sure to tighten pinion bearing lock screws evenly and securely to press pinion front bearing solidly against shoulder.

2. Mount a dial indicator on a rod fastened to a block of sufficient weight to hold the indicator button firmly against the ground portion of the propeller shaft, just to the rear of the splines as shown in figure 5-19.

3. Turn the shaft by hand from the pinion end and note the amount of runout as shown by the indicator. The total indicator reading should not exceed .015".

4. If the reading exceeds .015", turn shaft to high point on indicator and force end of shaft downward by hand sufficiently to spring it to within .015" runout. Recheck for run-out after each springing operation.

5-17 STRAIGHTENING PINION AND PROPELLER SHAFT ASSEMBLY, USING V-BLOCKS

If the fixture shown in figure 5-19 is not available, the pinion and propeller shaft may be checked and straightened using V-blocks or rollers and a dial indicator.

1. Support the assembly on V-blocks placed under the machined section just to rear of splines at "A" and under the rear (roller) bearing at "B". See figure 5-21.

2. Mount a dial indicator so that readings for run-out can be taken successively at points "C" located 3" from each end of shaft tube,

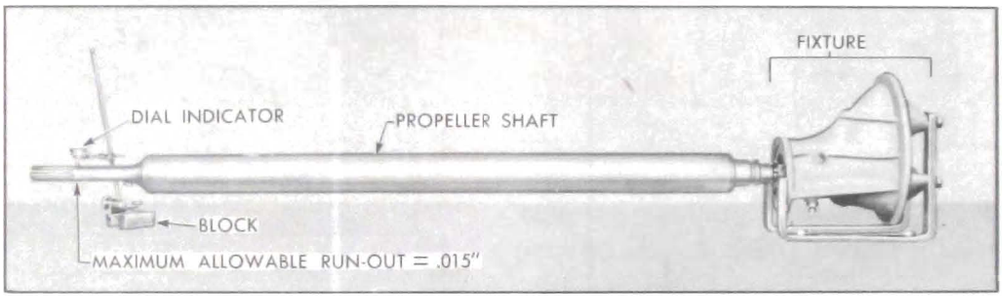


Figure 5-19—Straightening Propeller Shaft in Fixture

point "E" at middle of shaft tube, point "G" at front (ball) bearing, and Point "H" at front end of splines. When checking points "C" and "E", care must be taken not to permit the seam or hollow spots on tube to give a "bounce" to indicator and thus show a wrong indicator reading.

3. Check run-out at points "C" first. If total indicator reading is .005" or less, the shaft is OK at these points. If run-out exceeds .005", support the shaft at "A" and "D" (under lock sleeve) and exert pressure against high side of shaft at point "F" located on end of shaft tube where run-out exists. Use steady pressure and not shock blows to spring shaft as required to bring run-out at points "C" within .002".

4. Check run-out at point "E" after correcting any run-out at points "C". If run-out at "E" exceeds .010" total indicator reading, support the shaft at points "F" and exert steady pressure against high side of shaft as required to bring run-out within .010".

5. Check run-out at point "G" after correcting run-out at points "C" and "E". If run-out at "G" exceeds .001" total indicator reading, support the shaft at points "A" and "D"

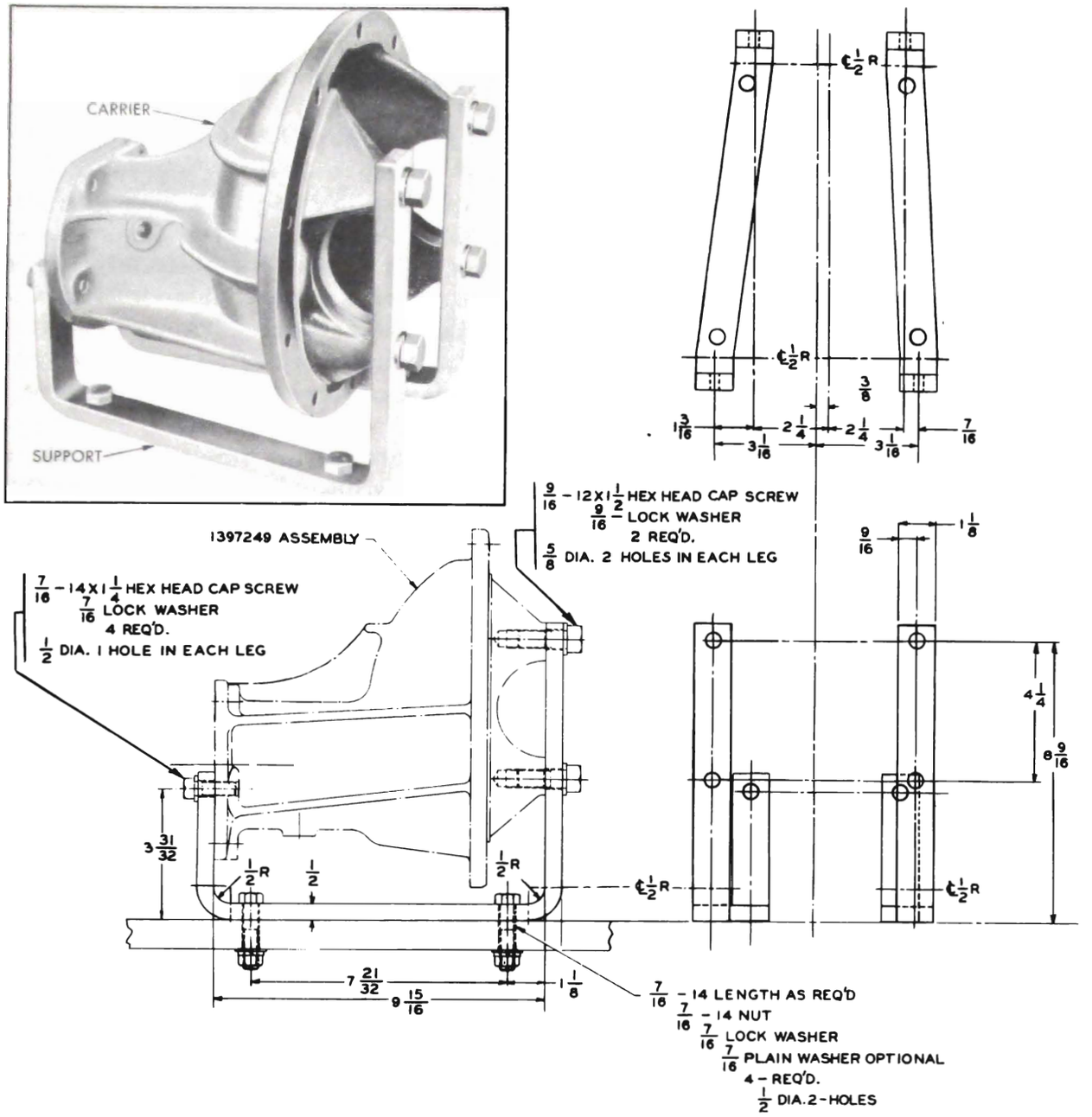


Figure 5-20—Fixture for Straightening Propeller Shaft

and exert steady pressure at the rearward point "F" on high side of shaft.

6. Finally, re-check run-out at points "C", "E" and "G" to make sure that run-out is within specified limits at all points. The run-out at point "H" should then be within .002" total indicator reading. More than .002" run-out at "H" will cause rapid wear of universal joint bushing and possible leakage of oil from transmission into rear axle.

5-18 INSTALLATION OF PINION AND PROPELLER SHAFT ASSEMBLY

Before installation of pinion and propeller shaft assembly make certain that interior of

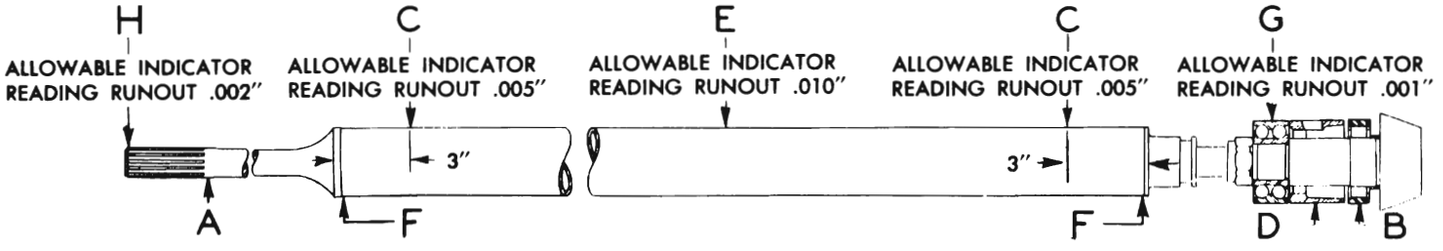


Figure 5-21—Propeller Shaft Run-Out Specifications

rear axle and third memoer housings are absolutely clean and dry. Also make certain that parts to be installed are clean and that pinion bearing shims are not damaged.

1. If the original third member housing and pinion shaft are being used, place the original number and thicknesses of pinion bearing shims over propeller shaft against front bearing, to maintain original setting of pinion.

2. If a new pinion is being installed, change the total thickness of shims by the difference between the old pinion and new pinion setting marks as explained in paragraph 5-19 below. For example: if old pinion is marked "+3" (plus 3) and new pinion is marked "−2" (minus 2), total thickness of shims installed should be .005" greater than shims removed.

NOTE: *Shims furnished with new gear sets are for use as required in adjustment and are not necessarily of correct total thickness.*

3. Lubricate both pinion bearings thoroughly with rear axle lubricant which should also be used to hold shims against front bearing.

4. As pinion and propeller shaft assembly is inserted into third member housing, turn pinion front bearing outer race so that the ball loading groove will be straight up, to prevent oil running through into torque tube. Also, turn propeller shaft to engage splined front end in splines of universal joint.

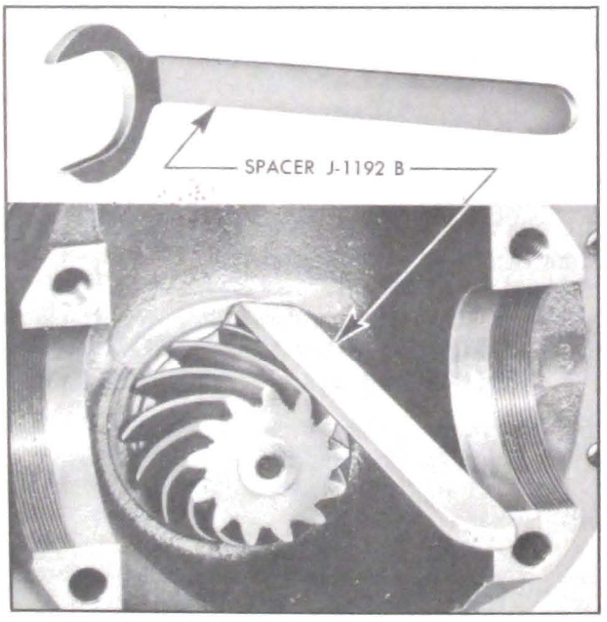


Figure 5-22—Use of Pinion Bearing Spacer J 1192-B

5. As the pinion rear bearing enters third member housing, place Pinion Bearing Spacer J 1192-B, (¼" thick) between bearing and pinion gear so that bearing can be pushed into place without binding against spacer on pinion shaft. See figure 5-22.

6. Lightly tap the pinion forward with a brass drift until the holes in pinion bearing lock sleeve align with tapped holes in carrier, then install the three sleeve lock screws. Tighten each lock screw a little at a time until lock sleeve and pinion front bearing are solidly seated and screws are uniformly tightened to 35-40 ft. lbs. torque. Tighten lock nuts to 15-20 ft. lbs. torque; excessive tightening of nuts may withdraw lock screws sufficiently to allow end play of pinion bearing. Remove Spacer J 1192-B.

7. Regardless of whether original or new parts affecting pinion setting are installed, check pinion setting with gauge as described in the following paragraphs (5-19, 5-20, 5-21).

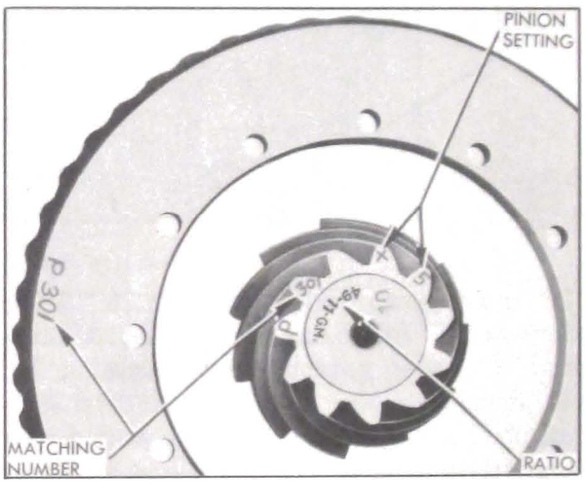


Figure 5-23—Ring and Pinion Gear Markings

5-19 INSTALLATION MARKS ON MATCHED RING AND PINION GEAR SETS

All Buick ring and pinion gear sets are selectively matched for quiet operation and proper tooth contact. After matching, a serial number is etched on one tooth of pinion and on rear face of gear to aid in keeping matched parts together. See figure 5-23. Parts having different matching serial numbers must never be used together.

Ring and pinion gear sets are matched in a special test machine which permits adjustment of pinion depth in ring gear until a point is reached where quiet operation and proper tooth contact under load is obtained. At this point, the setting of pinion with reference to centerline of ring gear is indicated by the machine.

This setting may vary a few thousandths of an inch from the design or "nominal" setting due to allowable variation in machining the parts.

In order to make it possible to duplicate the matching setting of the pinion when the gear set is installed in a third member housing, the pinion is marked to indicate this setting with reference to the "nominal" setting. The amount in thousandths of an inch plus or minus the "nominal" setting is etched on the small end of one pinion tooth. See figure 5-23. When a pinion is marked "+" (plus) it means that the pinion must be set at a distance from the centerline of the ring gear equal to the "nominal" setting *plus* the amount indicated on pinion tooth. When a pinion is marked "—" (minus) it means that the pinion must be set at a distance equal to the "nominal" setting *minus* the amount indicated on pinion tooth.

Pinion Setting Gauge J 681-A or J 2197 is required in order to measure the pinion setting after it is installed in a third member housing.

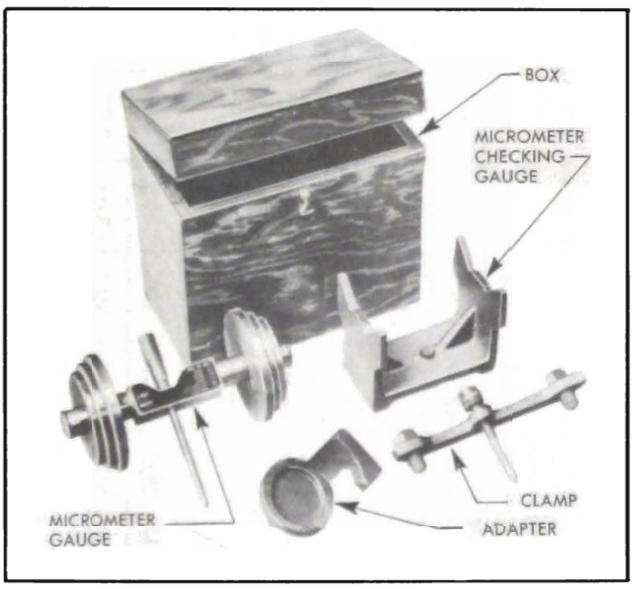


Figure 5-24—Pinion Setting Gauge

5-20 PINION SETTING GAUGES J 681-A AND J 2197

Pinion Setting Gauges J 681-A and J 2197 are identical except for the markings of the micrometer section, as described below. Either tool consists of a micrometer gauge, a checking gauge, an adapter for use with hypoid gear sets, and a clamp to hold the adapter in position. The micrometer gauge has sliding stepped collars so that gauge can be used in all models. The checking gauge should be used to test the accuracy at zero of the micrometer gauge before using the gauge. See figure 5-24.

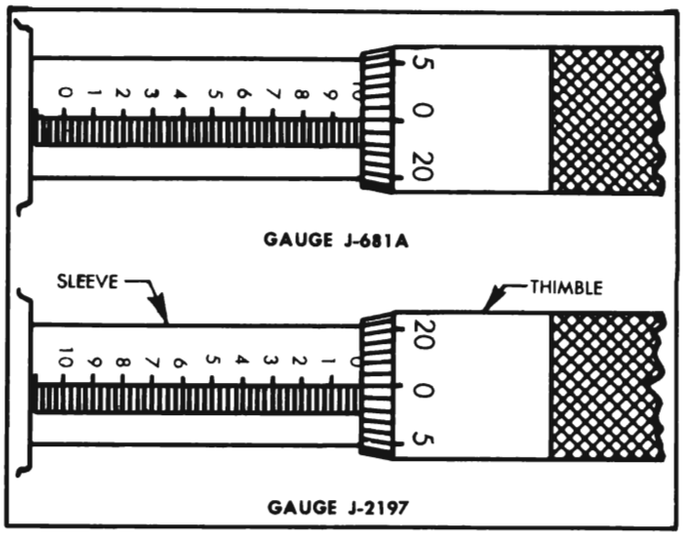


Figure 5-25—Micrometer Markings on Pinion Setting Gauges J 681-A and J 2197

a. Pinion Setting Gauge J 681A

Has the thimble and sleeve of the micrometer marked exactly like a standard micrometer. See figure 5-25. When the thimble is turned clockwise to extend the spindle, the reading becomes less. Consequently, when this gauge is used to measure depth of a pinion marked "+" (plus), the amount marked on the pinion tooth must be *subtracted* from the "nominal" micrometer reading. Likewise, if pinion is marked "—" (minus), the amount marked on the pinion tooth must be *added* to the "nominal" micrometer reading.

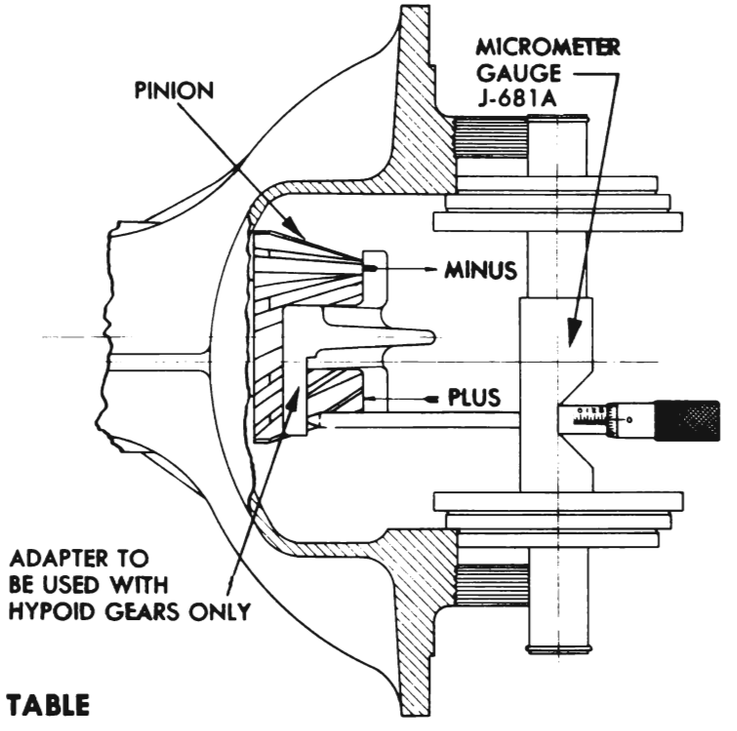
Example:

	a	*b*
Nominal micrometer reading (fig. 5-26)	.379	.379
Pinion marking (fig. 5-23)	+3	−2
	——	——
Correct setting (micrometer reading)	3.76	.381

b. Pinion Setting Gauge J 2197

Has the thimble and sleeve of the micrometer marked the opposite of a standard micrometer. See figure 5-25. When the thimble is turned clockwise to extend the spindle, the reading becomes greater. Consequently, when this gauge is used to measure depth of a pinion marked "+" (plus) the amount marked on the pinion tooth must be *added* to the "nominal" micrometer reading. Likewise, if pinion is marked "—" (minus), the amount marked on the pinion tooth must be *subtracted* from the "nominal" micrometer reading.

YEAR	SERIES	NOMINAL MICROMETER READING
1940-41-42	80-90	.203
1940-41-42	40, 50, 60, 70	.379
1946-7-8-9	40, 50, 70	.379
PINIONS MARKED "O" USE THE NOMINAL MICROMETER READING.		



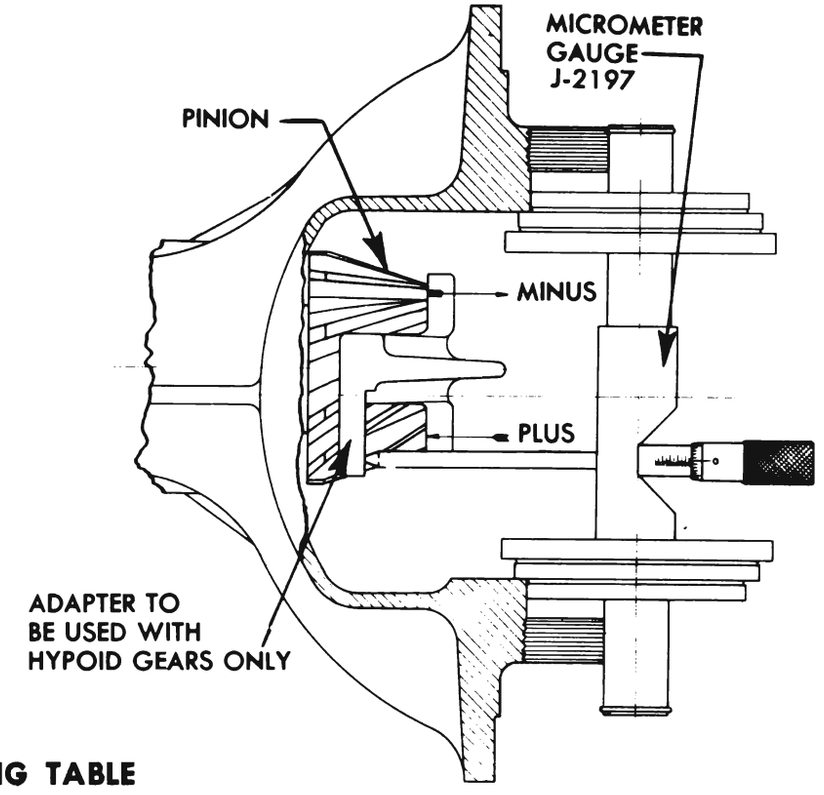
PINION SETTING TABLE

YEAR	SERIES	MICROMETER READINGS FOR PINIONS MARKED "PLUS" (+)														
		+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15
1940-41-42	80-90	.202	.201	.200	.199	.198	.197	.196	.195	.194	.193	.192	.191	.190	.189	.188
1940-41-42	40, 50, 60, 70	.378	.377	.376	.375	.374	.373	.372	.371	.370	.369	.368	.367	.366	.365	.364
1946-7-8-9	40, 50, 70	.378	.377	.376	.375	.374	.373	.372	.371	.370	.369	.368	.367	.366	.365	.364

YEAR	SERIES	MICROMETER READINGS FOR PINIONS MARKED "MINUS" (−)														
		−1	−2	−3	−4	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15
1940-41-42	80-90	.204	.205	.206	.207	.208	.209	.210	.211	.212	.213	.214	.215	.216	.217	.218
1940-41-42	40, 50, 60, 70	.380	.381	.382	.383	.384	.385	.386	.387	.388	.389	.390	.391	.392	.393	.394
1946-7-8-9	40, 50, 70	.380	.381	.382	.383	.384	.385	.386	.387	.388	.389	.390	.391	.392	.393	.394

Figure 5-26—Pinion Settings with Gauge J 681-A

YEAR	SERIES	NOMINAL MICROMETER READING
1940-41-42	80-90	.977
1940-41-42	40, 50, 60, 70	.802
1946-7-8-9	40, 50, 70	.802
PINIONS MARKED "O" USE THE NOMINAL MICROMETER READING.		



PINION SETTING TABLE

YEAR	SERIES	MICROMETER READINGS FOR PINIONS MARKED "PLUS" (+)														
		+1	+2	+3	+4	+5	+6	+7	+8	+9	+10	+11	+12	+13	+14	+15
1940-41-42	80-90	.978	.979	.980	.981	.982	.983	.984	.985	.986	.987	.988	.989	.990	.991	.992
1940-41-42	40, 50, 60, 70	.803	.804	.805	.806	.807	.808	.809	.810	.811	.812	.813	.814	.815	.816	.817
1946-7-8-9	40, 50, 70	.803	.804	.805	.806	.807	.808	.809	.810	.811	.812	.813	.814	.815	.816	.817

YEAR	SERIES	MICROMETER READINGS FOR PINIONS MARKED "MINUS" (−)														
		−1	−2	−3	−4	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15
1940-41-42	80-90	.976	.975	.974	.973	.972	.971	.970	.969	.968	.967	.966	.965	.964	.963	.962
1940-41-42	40, 50, 60, 70	.801	.800	.799	.798	.797	.796	.795	.794	.793	.792	.791	.790	.789	.788	.787
1946-7-8-9	40, 50, 70	.801	.800	.799	.798	.797	.796	.795	.794	.793	.792	.791	.790	.789	.788	.787

Figure 5-27—Pinion Settings with Gauge J 2197

Example:

	a	*b*
Nominal micrometer reading (Fig. 5-27)	.977	.977
Pinion marking (fig. 5-23) ...	+3	−2
	——	——
Correct setting (micrometer reading)	.980	.975

c. Nominal Micrometer Readings

Are different on Gauges J 681-A and J 2197 because of the differences in micrometer markings. The nominal micrometer readings for all 1940 through 1948 models when using Gauge J 681-A are given in figure 5-26. The nominal micrometer readings when using Gauge J 2197 are given in figure 5-27.

d. A Pinion Setting Table

Is given in figure 5-26 to simplify use of Gauge J 681-A, and a similar table is given in figure 5-27 for use with Gauge J 2197. To use either table, simply note the marking on the pinion tooth and look in the column of table headed by the same marking; the correct micrometer reading for proper pinion setting will be found in the column opposite the particular car year and series down at left end of table.

5-21 CHECKING PINION SETTINGS WITH GAUGE

1. Before Pinion Setting Gauge is installed, check the ends of pinion teeth and stone off any burrs; also rub stone over etched markings to remove high spots. The gauge adapter must seat flatly and firmly against ends of pinion teeth in order to secure an accurate micrometer reading.

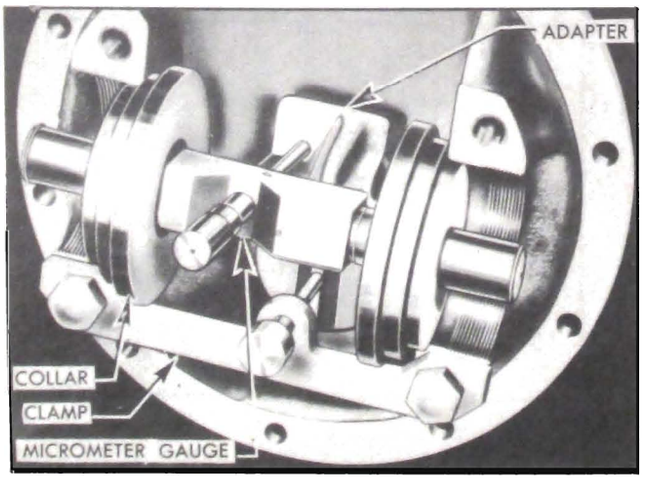


Figure 5-28—Pinion Setting Gauge Installed

2. Install adapter with clamp, and the micrometer gauge as shown in figure 5-28. The adapter must be firmly held against the pinion by the clamp. The micrometer gauge must be firmly seated in the differential bearing seats in carrier, with micrometer spindle at 90 degrees to surface of adapter.

3. The pinion setting is obtained by adjusting micrometer until the spindle just touches the adapter, then reading the micrometer. NOTE: *Swing the micrometer spindle up and down slightly while adjusting, to feel the exact point at which it contacts the adapter.*

4. When the actual pinion setting is obtained, compare it with the proper micrometer reading for the pinion marking as shown in figure 5-26 if using Gauge J 681-A, or shown in figure 5-27 if using Gauge J 2197. If the old ring and pinion gear set is being reinstalled, however, the original setting of the gears must be maintained, to avoid changing tooth contact.

5. If the pinion setting is not within .001", plus or minus, of the specified micrometer reading, adjust pinion as described in next paragraph (5-22).

5-22 ADJUSTMENT OF PINION GEAR

The pinion gear setting is adjusted by changing the total thickness of the pinion bearing shims which are located between the pinion front bearing and the shoulder in third member housing.

1. Remove pinion and propeller shaft assembly as previously described in paragraph 5-11, steps 3 and 4.

2. Remove all pinion bearing shims from shaft or in third member housing, wipe shims dry, and measure their total thickness with a micrometer, or with a dial indicator set to bear against a flat surface.

3. Increase or decrease total thickness of shims as required to obtain proper pinion setting, by using a different combination of shims. These shims are furnished in thicknesses ranging from .010" to .019" in increments of .001", so that any total thickness may be obtained by using a combination of different shims.

4. Install pinion and propeller shaft assembly with new combination of shims and be sure to tighten the three bearing sleeve locks uniformly to 35-40 ft. lbs. torque, and lock nuts to 15-20 ft. lbs. torque.

5. Check pinion setting with gauge. Setting

should be within .001" plus or minus, of required micrometer reading.

5-23 INSTALLATION OF DIFFERENTIAL RING GEAR AND CASE ASSEMBLY

1. Before installation of ring gear and case assembly make sure that differential bearing seats in carrier pedestals and caps are clean and free of burrs. Remove any burrs which might prevent bearings or bearing caps from seating properly.

2. Place outer races on differential bearings but do not oil bearings as this would interfere with bearing adjustment. Install gear and case assembly in carrier and slide bearing adjusters into position so that threads are engaged in threads in carrier pedestal.

3. Install bearing caps with bolts and lock washers. *Make sure that caps are installed in original positions as marked before removal.* Turn bearing adjusters to engage threads in caps. Tighten cap bolts to 20 ft. lbs. torque then loosen all four bolts ¼ turn.

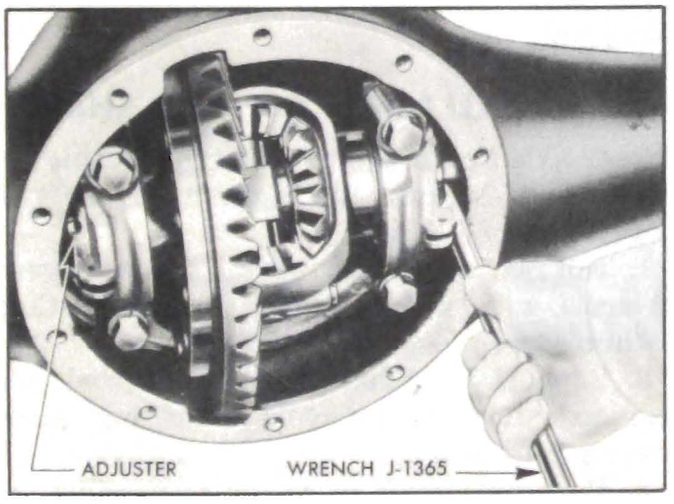


Figure 5-29—Adjusting Differential Bearings with Wrench J 1365

4. Using Adjuster Wrench J 1365 (fig. 5-29) turn adjusters as required to set ring gear lash at approximately .008" to .012", with both adjusters in firm contact with bearings. CAUTION: *Do not use punch and hammer to turn adjusters as adjusters will be distorted (see fig. 5-30) and proper bearing adjustment cannot be obtained.*

5. Back off one adjuster (preferably left) while observing bearing rollers and outer race, until rollers and race just stop turning, then tighten adjuster 4 to 5 notches to properly seat bearings and adjusters.

6. Slowly back off adjuster until bearing outer race just stops turning. Recheck for this

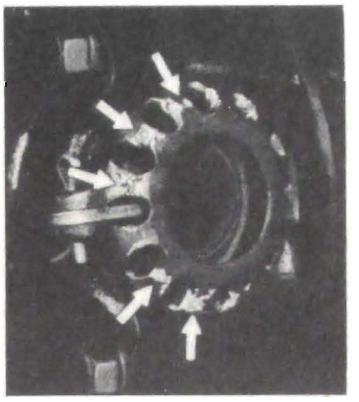


Figure 5-30—Adjuster Mutilated by Wrong Tool

"free position" at least once to make sure of proper position.

7. From the "free Position" tighten the adjuster 2½ to 3 notches to pre-load the bearings, then tighten all 4 bearing cap bolts to 65-70 ft. lbs. torque.

8. Mount dial indicator as shown in figure 5-31. Use a small button on indicator stem so that contact can be made off the edge of tooth. Set dial indicator so that indicator stem is as nearly in line with gear rotation as possible. If stem bears against edge of tooth, or stem is at considerable angle to the line of gear rotation, a false indication of backlash will be obtained.

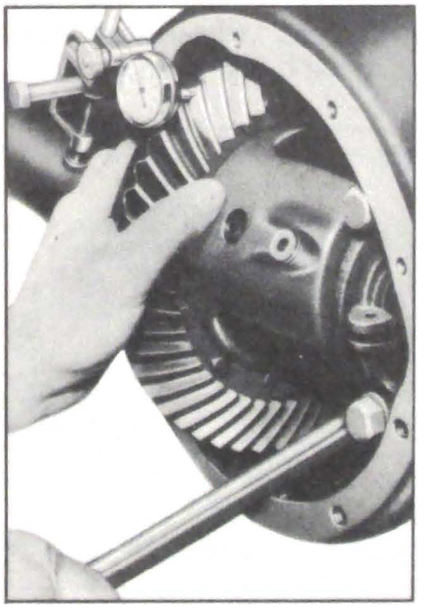


Figure 5-31—Checking Backlash with Dial Indicator

9. Lock the pinion with hammer handle or small bar and move ring gear through backlash range while observing movement of indicator hand. Check backlash in this manner at three or four points around ring gear to determine points of minimum backlash.

10. *The desired backlash is .008" to .010"; however, backlash at minimum point should not be less than .008" and at maximum point should not exceed .012".* If original ring and pinion gear set is being reinstalled, the original lash of gears should be maintained to avoid changing tooth contact.

11. If backlash is not within limits specified above, move ring gear to right or left as required to secure proper backlash. To move ring gear, loosen all bearing cap bolts ¼ turn; loosen one notch on bearing adjuster on side toward which gear is to be moved and *tighten one notch* on opposite adjuster. *When one adjuster is loosened always tighten opposite adjuster the same amount in order to maintain the bearing preload adjustment made in step 7 above.* One notch change of both adjusters in the same direction will change backlash .004" to .005". The offset ends of bearing adjuster locks used in 1948 are designed to permit half-notch adjustments.

12. Always tighten all bearing cap bolts to 65-70 ft. lbs. torque after adjusters have been moved and recheck backlash with dial indicator as described in step 8 above. When backlash is properly set, install both bearing adjuster locks.

13. Install differential side gears and thrust washers in case. See figure 5-32.

14. Install rear wheel bearings and axle shafts (par. 5-24 and 5-25).

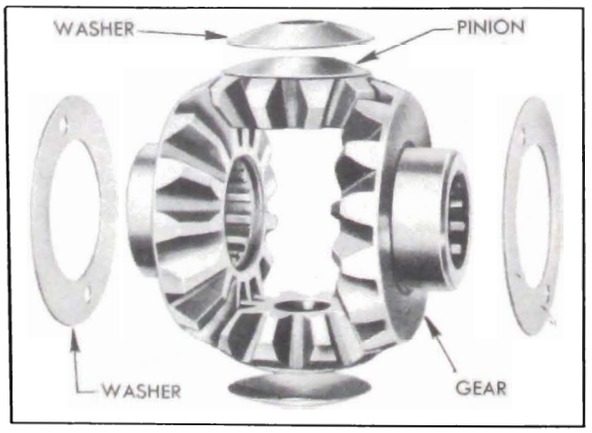


Figure 5-32—Differential Side Gears, Pinions, and Thrust Washers

5-24 INSTALLATION OF REAR WHEEL BEARINGS AND OIL SEALS

1. Drive a new inner oil seal squarely and lightly against shoulder in axle housing, using care to avoid distortion of seal.

2. Install bearing roller assembly, using care to start it squarely into axle housing by light taps with a brass drift on alternate sides of outer race. *Do not drive against the rollers.* Drive outer race lightly against the shoulder in axle housing.

3. Drive a new outer seal lightly against outer race of bearing, using care to avoid distortion.

4. Install brake backing plate with a new gasket between plate and axle housing. Connect shock absorber link to shock absorber arm, and connect brake pipe to wheel cylinder. NOTE: *Wheel cylinder will be bled later, in paragraph 5-25, step 9.*

5. If wheel bearing inner race requires replacement, remove old race from axle shaft by grinding part way through race and splitting it. CAUTION: *Use care to avoid personal injury from flying particles of steel.* Press new bearing race into place against shoulder on axle shaft.

6. Install axle shafts as described in next paragraph (5-25).

5-25 INSTALLATION OF AXLE SHAFTS

Rear axle shafts are not interchangeable between sides because the right hand shaft is longer than the left.

1. Fill rear wheel bearing and space between oil seals with wheel bearing lubricant. Coat leather edges of oil seals with lubricant.

2. Support axle shaft as it is inserted into rear axle housing to avoid damaging wheel bearing oil seals.

3. Push axle shaft in as far as possible, install horseshoe-shaped lock washer in groove in inner end of shaft, then pull shaft out to seat lock washer in recess in differential side gear.

4. Install differential spacer between ends of axle shafts and with both shafts pulled outward as far as possible, check clearance between spacer and shafts with feeler gauges. Total clearance, or axle shaft end play, should be between .000" and .008".

5. If clearance exceeds .008", turn spacer ¼ turn and test clearance again; the spacer has two different thicknesses to permit a selective fit.

6. If clearance or axle shaft end play cannot be adjusted to .008" or less with old spacer, install a new spacer. Service spacers are oversize to permit some take up for wear.

7. In some cases, however, it may not be possible to adjust end play to specified limits by installation of oversize spacers; therefore, new bronze thrust washers should be installed between the differential case and the side gears before selecting a spacer of proper thickness to provide not over .008" end play. See figure 5-32.

8. After proper axle shaft end play is obtained, place side pinions and thrust washers in case and push differential side pinion shaft through case, thrust washers, and pinions. Lock shaft in place with lock screw and lock washer.

9. If brake backing plate was removed, bleed the wheel cylinder as described in paragraph 8-9, then install rear wheel.

10. Pour a liberal quantity of rear axle lubricant on gears and bearings, and turn rear wheels to work lubricant into all surfaces.

11. Install housing cover, using a new gasket and coating bolt threads with white lead to avoid oil leaks. Align filler plug with first bolt hole to right of lower center bolt hole in housing. This change from straight down position increases oil level to 4 pints.

12. Remove car stands so that car is level, and fill housing to filler plug opening with approved rear axle, (par. 1-9).