REPAIR and TUNE-UP MANUAL

Illustrated Service Procedure and Specifications for

1938
PACKARD

SIX, 1600
EIGHT, 1601, 1602, 1603

SPECIFICATIONS

Series 1600, 1601, 1602

1938 Models

SIX, 1600 — Wheelbase, 122"

SEDANS: Four-Door Touring, Two-Door Touring.

COUPES: Business Coupe, Convertible Coupe, Club Coupe.

EIGHT, 1601 — Wheelbase, 127"

EIGHT, 1602 — Wheelbase, 148"

SEDANS: Four-Door Touring, Two-Door Touring.

COUPES: Business Coupe, Convertible Coupe, Club Coupe.

1938 Motors

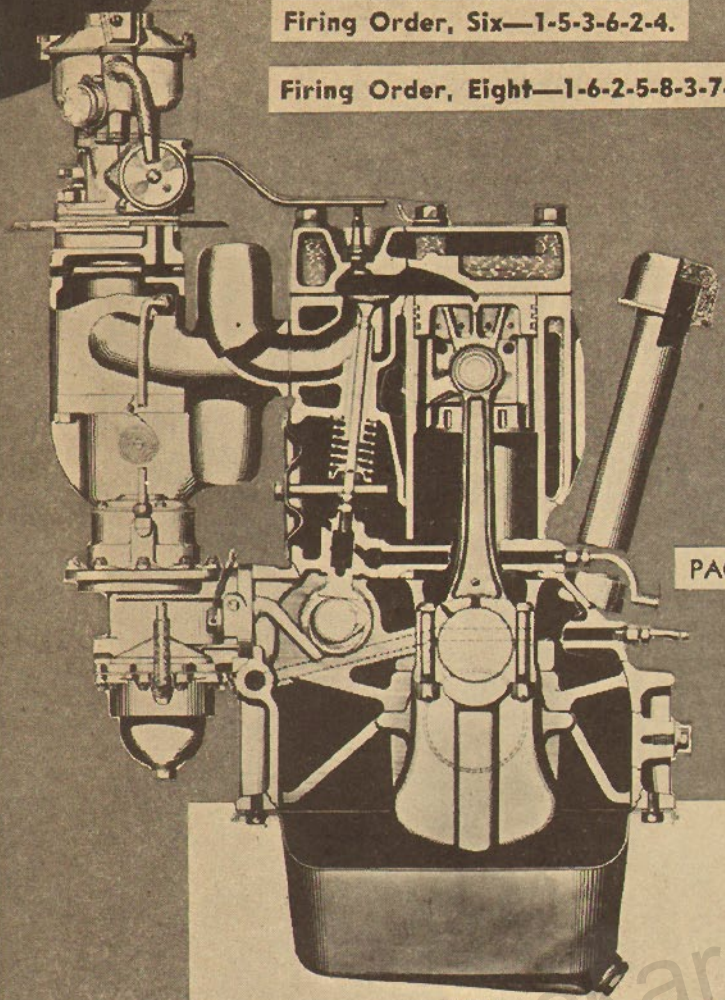
SERIES 1600: Six cyl., bore, 3½"; stroke, 4¼". Piston displacement, 245.34 cu. in. Compression ratio, 6.52 to 1. Optional, 7.05 to 1. H.P., A.M.A., 29.4; brake, 100 at 3600.

SERIES 1601-2: Eight cyl., bore, 3¼"; stroke, 4¼". Piston displacement, 282.05 cu. in. Compression ratio 6.6 to 1. Optional, 7.05 to 1. H.P., A.M.A., 33.8; brake 120 at 3800.

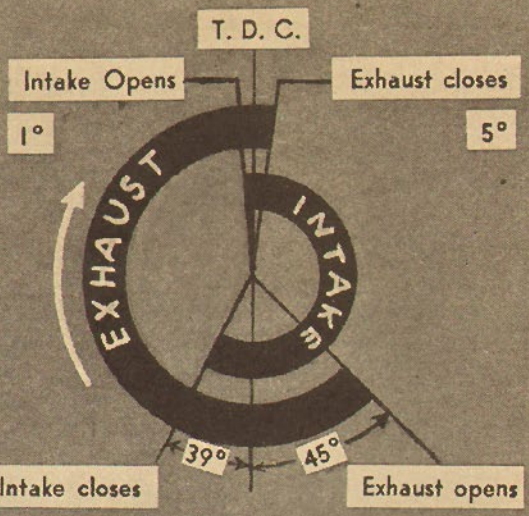
PACKARD SIX, EIGHT, '38—MOTOR

Firing Order, Six—1-5-3-6-2-4.

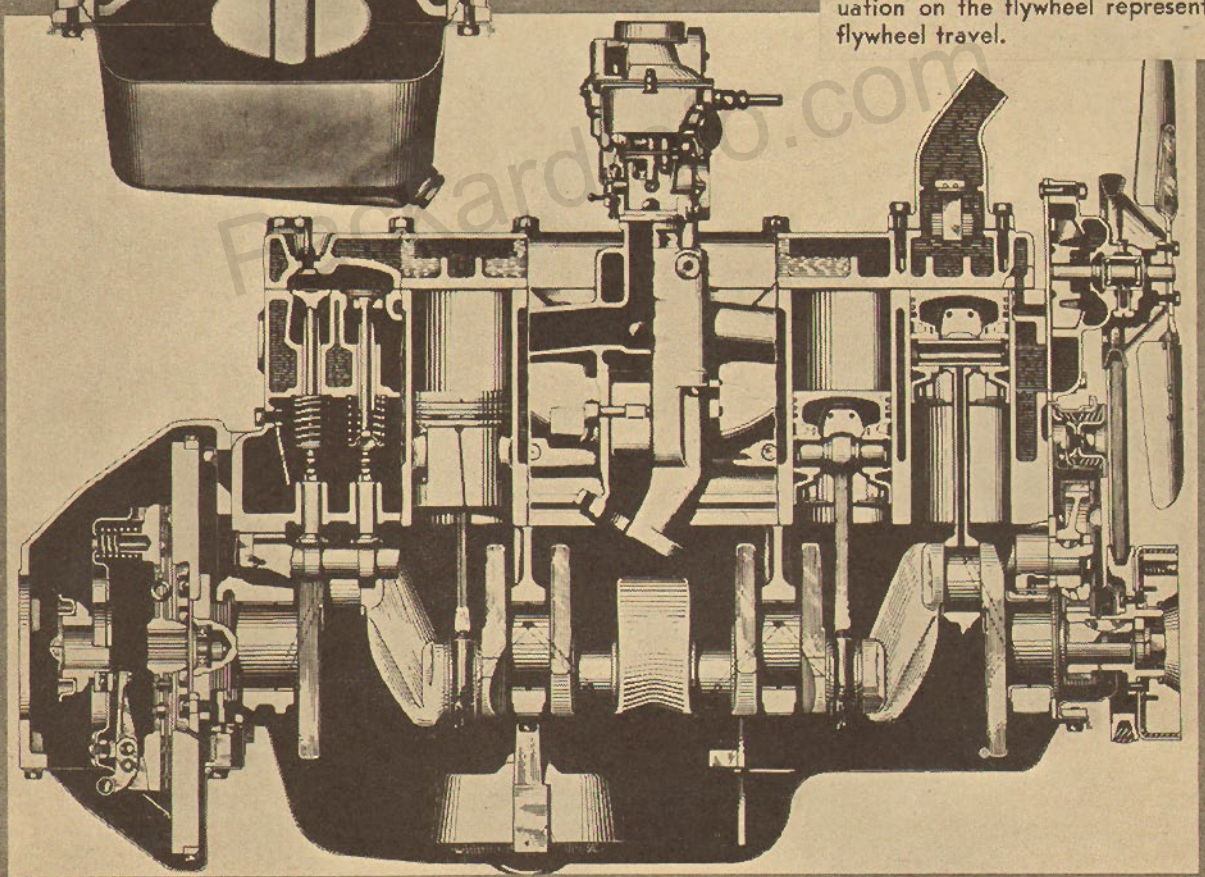
Firing Order, Eight—1-6-2-5-8-3-7-4.



PACKARD SIX ENGINE



VALVE TIMING, SIX AND EIGHT: Adjust No. 1 cylinder exhaust valve tappet to clearance of .015". Crank engine until No. 1 piston is coming up on exhaust stroke. Stop when pointer at the timing hole is in register with 2½ graduations past T. D. C. mark. At this point the exhaust valve tappet should just be free of lifter. Each graduation on the flywheel represents 2° flywheel travel.



PISTONS: Autothermatic aluminum alloy, with steel strut. Removed from top of engine. Skirt clearance .0015". Piston pin fit in piston, finger push fit at 160° F., weight, on six 19½ oz., eight 16⅞ oz.

PISTON PINS: Full floating type. Fit in piston at finger push fit, piston heated to 160° F. Recommended clearance of pin in rod is .0002".

PISTON RINGS: Two compression and one oil. Gap clearance .007" to .015" on all.

CONNECTING RODS: Length, 7-11/16" center to center. Install rods with oil hole at crankpin end toward camshaft. Connecting rod weight, rod only, 1 lb. 15.6 oz.

CONNECTING ROD BEARINGS: Steel back babbitt lined precision type. Bearing not adjustable, may be replaced without reaming or fitting. Clearance, .0005" to .0015", side play, .004" to .010".

OIL PUMP: Oil pump on both Six and Eight is of the gear type. Pressure of 35 lbs. at normal driving speeds, pressure relief valve located in pump, not adjustable.

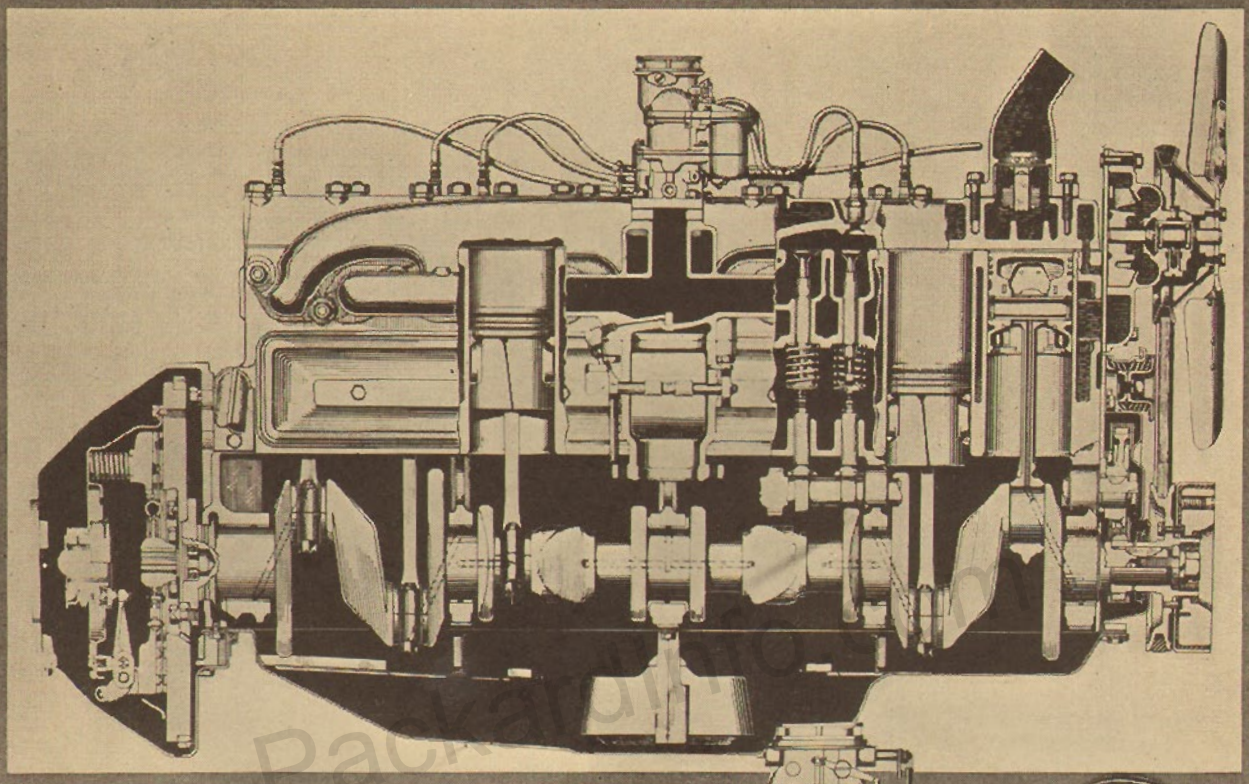
MOTOR—PACKARD SIX, EIGHT

VALVE RUNNING CLEARANCE: Both models. Warm engine, inlet .007", exhaust .010".

VALVE SEAT ANGLE: Intake, 30°; exhaust, 45°.

WATER PUMP: The pump unit in both Six and Eight is of the packless type. The shaft running on ball bearings requires lubrication every 5,000 miles. S. A. E. No. 30 engine oil. If for any reason the pump should leak remove the assembly and renew the sealing element.

PACKARD EIGHT ENGINE

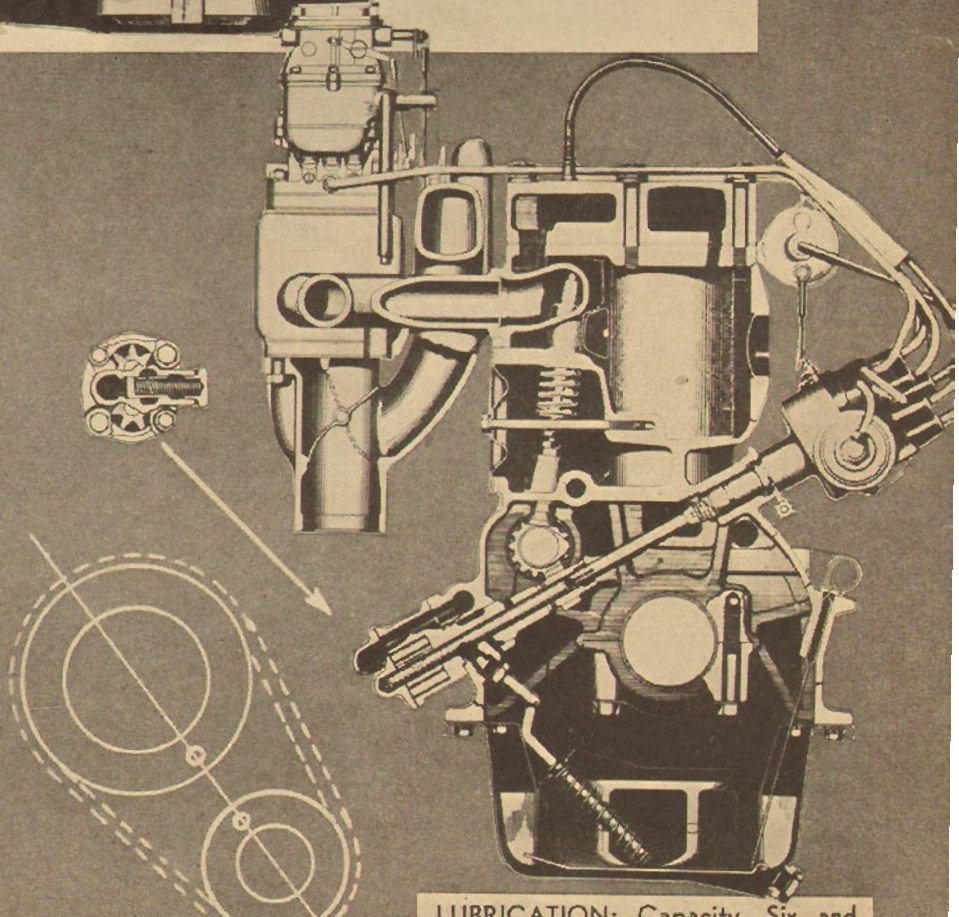


VALVE SPRING PRESSURE: When compressed to 1⅝", 50 lb. (valve closed). When compressed to approximately 1-5/16", 120 lbs. (valve open).

VALVE GUIDES: Valve stem to guide clearance, intake .002"; exhaust, .004".

MAIN BEARINGS: Steel back babbitt lined. Removable without removing crankshaft. Bearing clearance, .001" to .003"; end play .003" to .008" on both models. On the Six, thrust is taken on No. 1 bearing and the Eight on the center bearing.

FAN BELT ADJUSTMENT: Loosen two generator pivot bolts and the hinge bolt and lock bolt on adjusting link. Hook spring scale to the bolt passing through the generator lug and pull in line with the link until scale pointer registers 25 lbs. Hold in this position and tighten bolts. If a scale is not available, adjust belt tension to provide ½" thumb pressure deflection midway between generator and water pump pulley.



TIMING CHAIN SETTING

LUBRICATION: Capacity, Six and Eight, 6 qts. Summer temperatures of 90° F., S. A. E. No. 40; plus 32° F., S. A. E. No. 30; plus 10° F., S. A. E. 20W; minus 10° F., 10W.

PACKARD SIX, EIGHT, '38—TUNE-UP

SPARK PLUG GAP, .025" TO .030".

CONTACT POINT GAP

Six, .018" to .022".

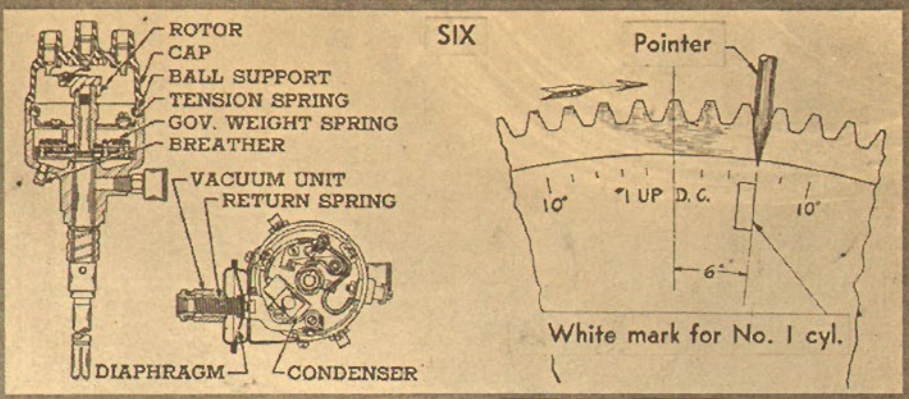
Eight, .0125" to .0175".

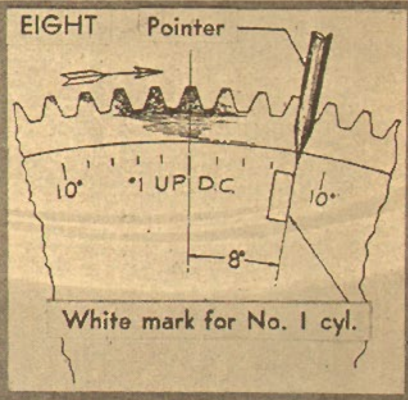
BREAKER POINT SPRING TENSION: 19 to 23 oz.

SPARK CONTROL: Full automatic, spark advance begins at 600 R. P. M. (engine).

IGNITION TIMING, SIX: With fuel compensator set at zero, spark should occur in No. 1 cylinder 4½° to 6°, or 2 to 3 graduations on the flywheel, before T. D. C. Flywheel mark "U. D. C. 1" indicates top center.

IGNITION TIMING, EIGHT: With fuel compensator set at zero, spark should occur in No. 1 cylinder 6½° to 8°, or 3 to 4 graduations on flywheel, before T. D. C.

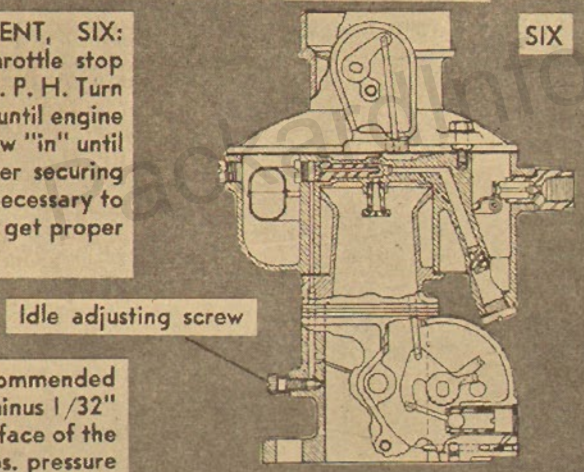




OPTIONAL ALUMINUM HEADS, SIX AND EIGHT: Engines with 7.05 to 1 aluminum heads should be timed 2½° to 4°, or 1 to 2 flywheel graduations before top center.

CARBURETOR

IDLE SPEED ADJUSTMENT, SIX: With engine warm, set throttle stop screw for car speed of 8 M. P. H. Turn idle adjusting screw "out" until engine starts to roll. Then turn screw "in" until engine runs smoothly. After securing idle adjustment it may be necessary to reset the idle stop screw to get proper idle speed.



Chandler-Groves, Model 119-5

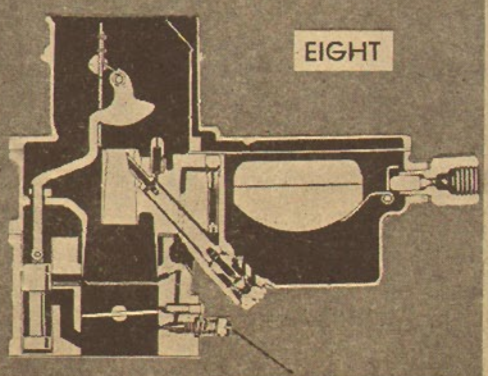
IDLE SPEED ADJUSTMENT, EIGHT: With engine warm set throttle stop screw to 6 M. P. H. Adjust one idle adjusting needle at a time. Turn "in" until engine runs irregularly, then "out" until engine begins to "roll," then in again slowly until smoothest running is obtained. Make same adjustment on remaining idle adjusting needle.

FLOAT LEVEL, SIX: Recommended fuel level is 17/32" plus or minus 1/32" below the machined top surface of the float bowl, with 2½ to 3 lbs. pressure on the fuel. Top of the float at free end should be 3/16" below top of bowl with gasket removed.

FUEL LEVEL, EIGHT: Recommended fuel level is 15/32" plus or minus 1/32" below machined top surface of float bowl, with 2½ to 3 lbs. pressure on fuel.

FUEL PUMP PRESSURE: 2½ to 3 lbs.

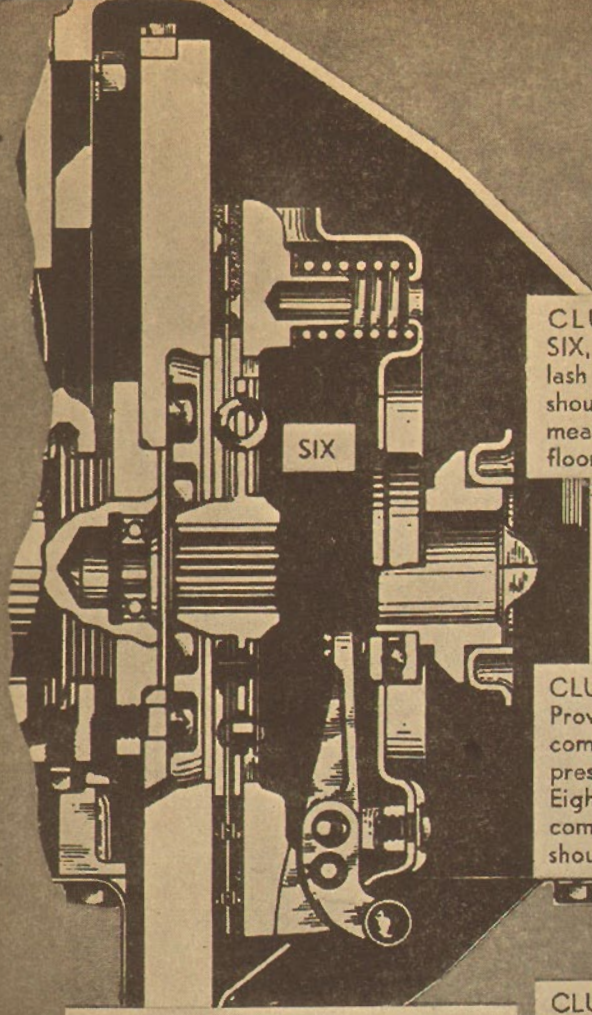
CHOKE ADJUSTMENT, SIX: Ordinarily the choke will require no adjustment throughout its life. If warm-up period indicates too rich, or too lean mixture, check thermostat. When choke valve is closed by hand, it should open freely without bind. Adjustment of thermostat spring is correct when factory punch mark on plate aligns with similar mark on housing. Adjust by turning screw until marks are aligned. With further indications of too rich or lean a mixture, remove thermostat and increase or decrease spring tension ½ graduations at a time. When making this adjustment a maximum of five graduations should never be exceeded. If correct adjustment is not obtained after the above has been set, replace the thermostat unit.

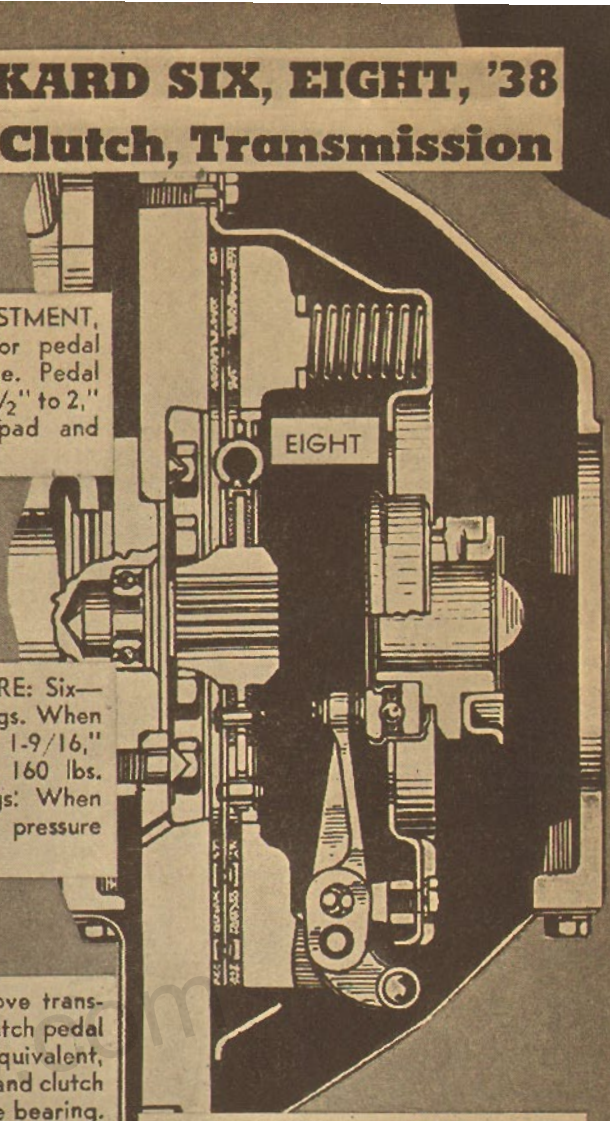


Stromberg, Model 10-33

CHOKE ADJUSTMENT, EIGHT: Factory setting is when the arrow on prong plate is aligned with the 11th graduation (in the "rich" direction) from the zero mark on main plate. If arrow is not so aligned turn adjustment screw to secure this position. Check bearing friction and free movement of piston and lever and reinstall assembly to manifold. Adjust link rod so that thermostat lever is 1/16" away from the combination stop pin and adjustment screw, when choke valve is fully closed. If mixture is still too rich or lean, remove thermostat assembly and decrease or increase the spring tension 1 graduation at a time. Satisfactory results should be obtained by changing the adjustment not more than 5 graduations, from the original setting of 11 graduations "rich." If satisfactory results are not obtained within these limits, the thermostat should be renewed.

PACKARD SIX, EIGHT, '38
Clutch, Transmission





CLUTCH PEDAL ADJUSTMENT, SIX, EIGHT: Adjustment for pedal lash made at pedal linkage. Pedal should have a free travel of 1½" to 2," measured between pedal pad and floor board.

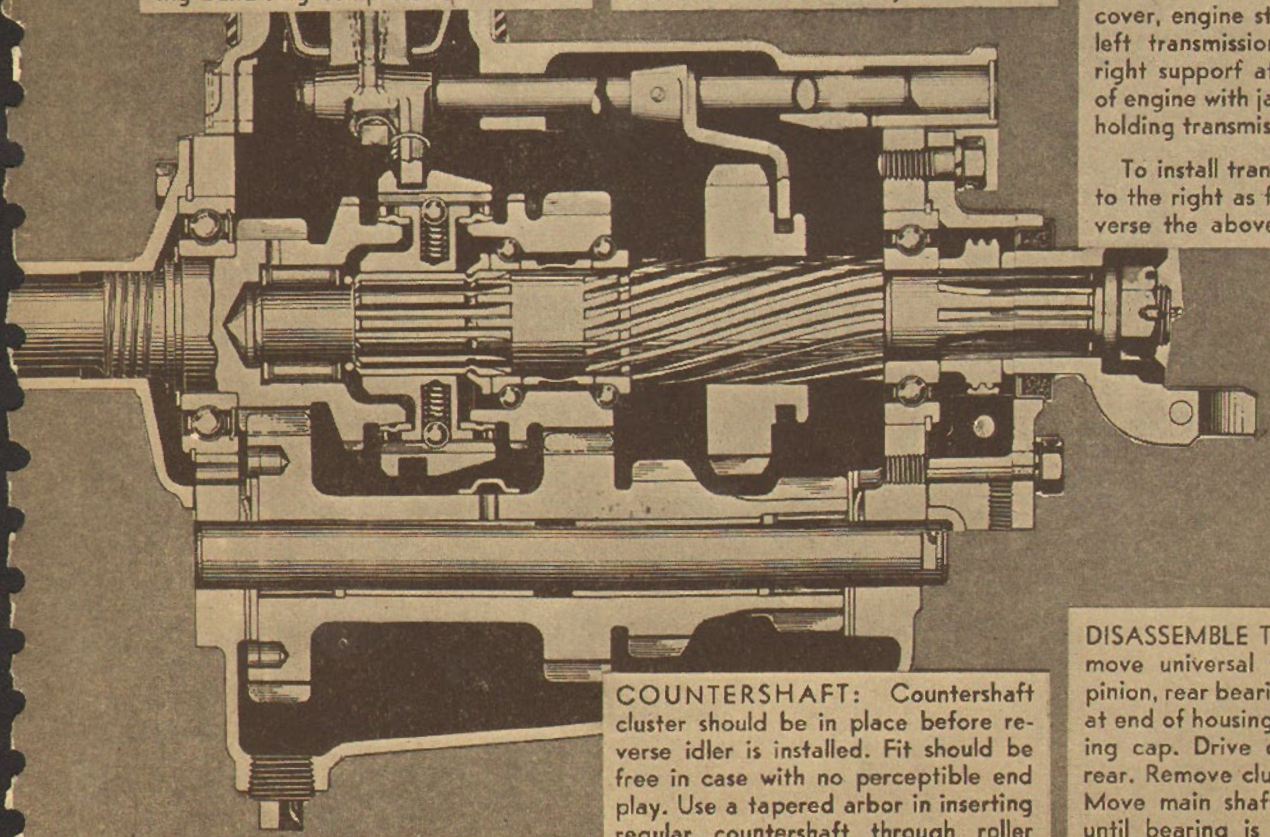
CLUTCH SPRING PRESSURE: Six—Provided with 6 clutch springs. When compressed to a length of 1-9/16," pressure should be 150 to 160 lbs. Eight—Has 9 clutch springs. When compressed to 1-9/16," pressure should be 112 to 120 lbs.

NOTE: Transmission sliding gears should be marked before dismantling to insure reinstallation in original position. Do not shift gears with the transmission cover removed, as synchro-mesh balls and springs will jump out. To install balls and springs, use clamping band ring compressor.

CLUTCH REMOVAL: Remove transmission assembly. Depress clutch pedal and insert a wedge, or its equivalent, between each release finger and clutch cover. Remove clutch release bearing. Remove clutch pedal rod by removing retaining cotter pins. Remove cover plate cap screws and withdraw clutch. Remove assembly from below.

TRANSMISSION REMOVAL: Clear floor boards. Drop propeller shaft. Disconnect speedometer and ground cables. Remove clutch housing lower cover, engine stabilizer and right and left transmission supports, removing right support at frame. Support rear of engine with jack and remove 4 bolts holding transmission to clutch housing.

To install transmission, move engine to the right as far as possible and reverse the above procedure.



COUNTERSHAFT: Countershaft cluster should be in place before reverse idler is installed. Fit should be free in case with no perceptible end play. Use a tapered arbor in inserting regular countershaft through roller bearings, making sure that lug on bronze washer at each end is aligned with corresponding slots in case.

DISASSEMBLE TRANSMISSION: Remove universal flange, speedometer pinion, rear bearing cap and lock plate at end of housing. Remove front bearing cap. Drive counter shaft to the rear. Remove clutch shaft from front. Move main shaft with gears to rear until bearing is released from case, then pass up through main cover opening. Remove counter shaft cluster gear. Drive reverse idler shaft out to rear.

LUBRICATION: Capacity, 1 quart or 2 lbs. Summer, S. A. E. 160; winter, S. A. E. 90.

PACKARD SIX, EIGHT, '38—Steering, Axles

SPECIFICATIONS

Caster Angle	$1\frac{1}{2}° + -\frac{1}{2}°$
Camber	$\frac{1}{2}° + -\frac{1}{2}°$
Toe-In	1/32" to 1/16"
King Pin Angle	1° 54'

TOE-IN ADJUSTMENT: Inflate tires to recommended pressure. Check front wheel bearings. Center steering gear worm on "high spot," front wheels straight ahead. Distance measured from brake backing plate to first frame rivet back of bumper, should be equal on both sides. If the difference is found to be more than $\frac{1}{8}$", lengthen tie rod on short side until both wheels are centered. Adjust toe-in by turning each cross tube same amount until 1/32" to 1/16" is obtained. Toe-in measurement made at hub height at center of tire tread.

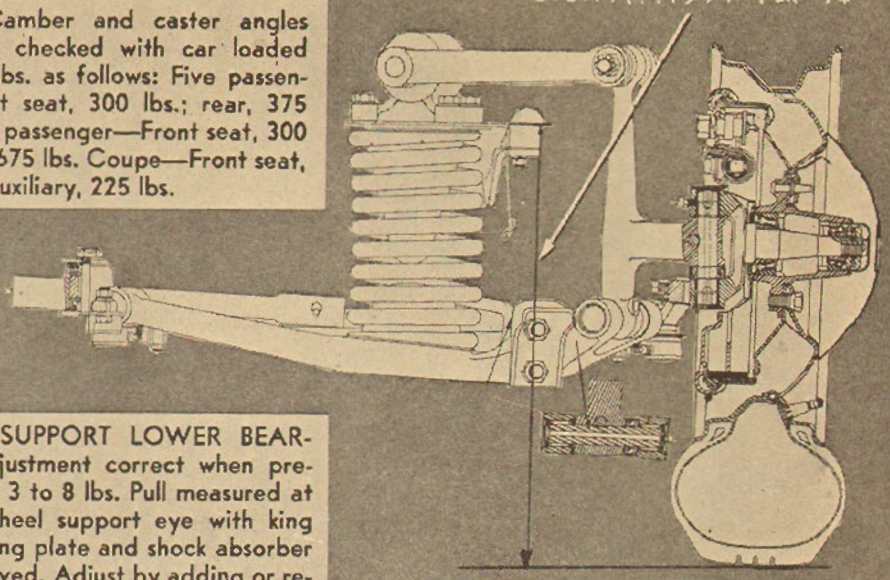
CASTER ANGLE: Adjustment obtained by installing or removing tapered shims, between forward end of torque arm and wheel support arm. Shims of $\frac{1}{2}°$ and 1° available.

CAMBER ANGLE: Adjusted by installing offset pilot thimbles at outer end of shock absorber arm and support bolt. Pilots of zero, 1/16", $\frac{1}{8}$" and 3/16" offset are available. A change of 1/16" changes camber $\frac{1}{3}°$.

NOTE: Camber and caster angles should be checked with car loaded with 375 lbs. as follows: Five passenger—Front seat, 300 lbs.; rear, 375 lbs. Seven passenger—Front seat, 300 lbs.; rear, 675 lbs. Coupe—Front seat, 300 lbs.; auxiliary, 225 lbs.

SIX . . . . 18 7/8" + OR − 1/4"

EIGHT . . . 19 1/4" + OR − 1/4"



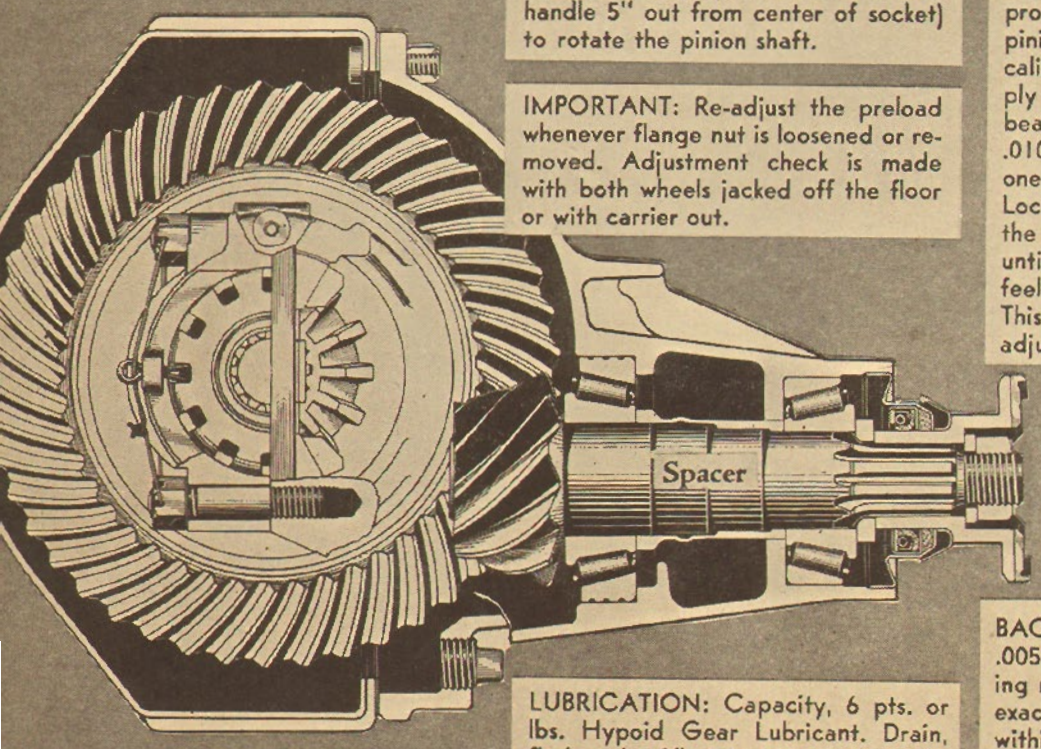
WHEEL SUPPORT LOWER BEARING: Adjustment correct when preloaded to 3 to 8 lbs. Pull measured at top of wheel support eye with king pin, backing plate and shock absorber bolt removed. Adjust by adding or removing shims. Shims available in steps of .001".

DIFFERENTIAL SIDE BEARINGS: Should be adjusted to a preload of from .010" to .012" spread of the bearing support pedestals. Loosen each side bearing cap just slightly, then back off the right hand (viewed from rear) bearing adjusting nut until ring gear mount is loose in bearings. Make sure that the left hand adjusting nut is backed out far enough to provide some lash between ring and pinion gears. Use a large outside caliper and a .010" feeler blade. Apply caliper from finished boss of one bearing cap to the other with the .010" feeler blade interposed between one of the bosses and the caliper. Lock caliper at this setting. Tighten the right hand bearing adjusting nut until "set" caliper (minus the .010" feeler) will just slide over both bosses. This indicates desired .010" spread adjustment.

REAR AXLE

PINION SHAFT BEARINGS: Adjusted to a preload or drag of 25 to 34 inch pounds. The self-locking flange nut should be tightened until it buckles the spacer sufficiently to require a pull of 5 to 6 lbs. (measured on wrench handle 5" out from center of socket) to rotate the pinion shaft.

IMPORTANT: Re-adjust the preload whenever flange nut is loosened or removed. Adjustment check is made with both wheels jacked off the floor or with carrier out.

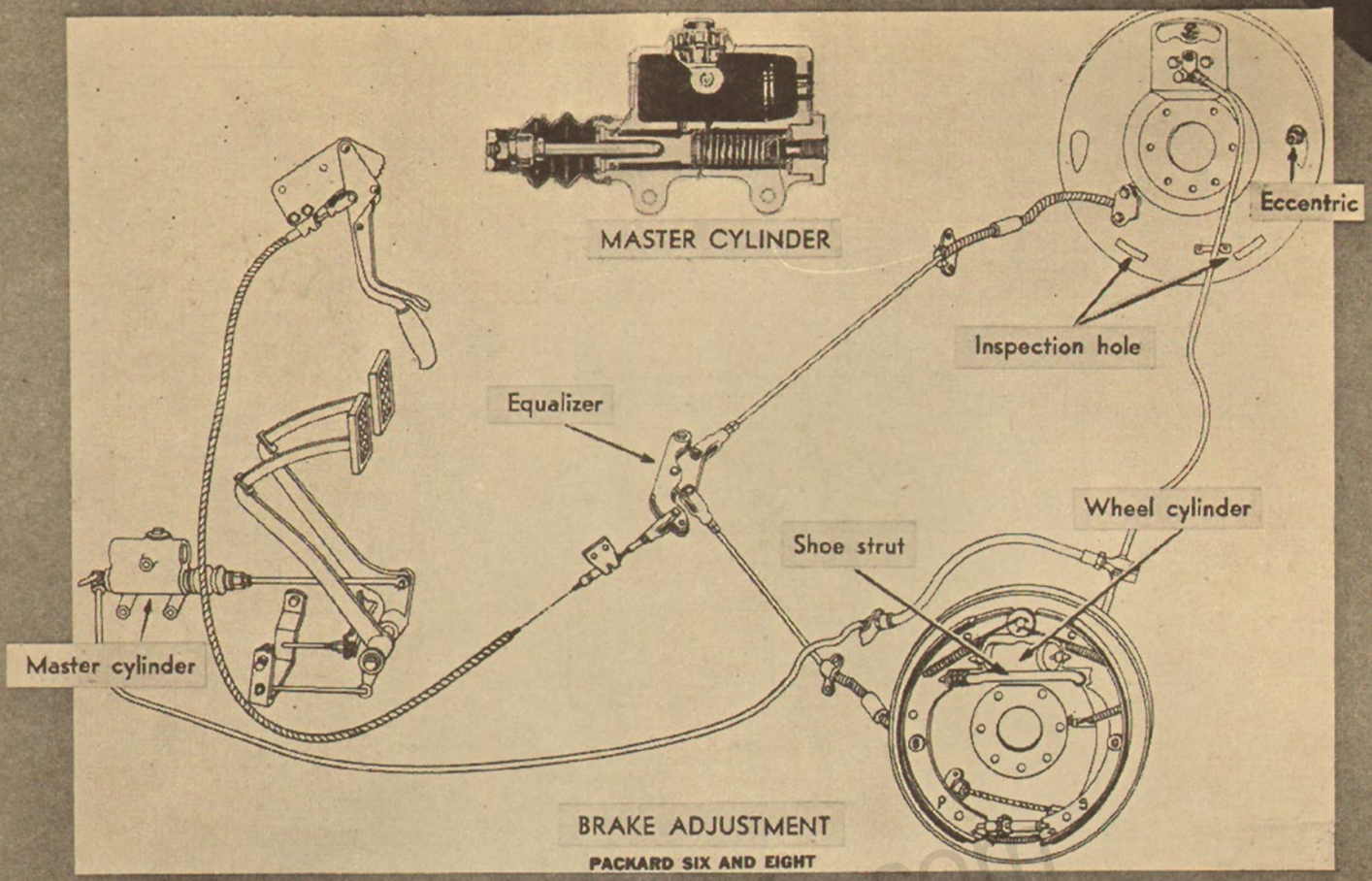


BACK-LASH: If lash is more than .005" back off the right hand adjusting nut and tighten the left hand nut exactly the same amount until lash is within the .003" to .005" limit. By turning each nut the same amount, back-lash may be adjusted without disturbing preload spread adjustment of bearings.

LUBRICATION: Capacity, 6 pts. or lbs. Hypoid Gear Lubricant. Drain, flush and refill at 10,000 mi. intervals. Use light motor oil or flushing oil to clean axle housing. NEVER use kerosene, or gasoline for flushing.

AXLE SHAFT END PLAY: Adjustable by means of shim pack. End play, .004" to .007".

BRAKES—PACKARD SIX, EIGHT, '38



BRAKE ADJUSTMENT

PACKARD SIX AND EIGHT

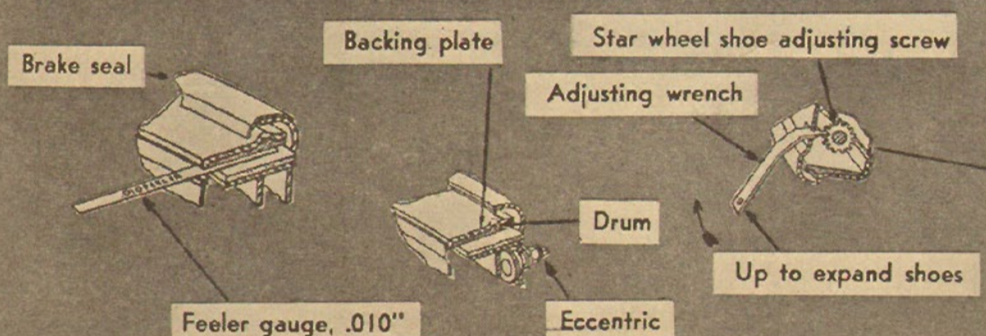
ADJUSTMENT FOR WEAR: Raise 4 corners of the car and remove wheels. Place hand brake in fully released position. Remove adjusting hole covers from backing plate and covers from drum ports. Insert a .010" feeler gauge between lining and drum at lower end of secondary shoe (rear shoe) and turn eccentric toward front of car until feeler is just firmly gripped. Hold this position, and tighten lock nut. Turn star wheel adjuster until slight drag is felt, then back off until drum just turns freely. Make adjustment at each brake.

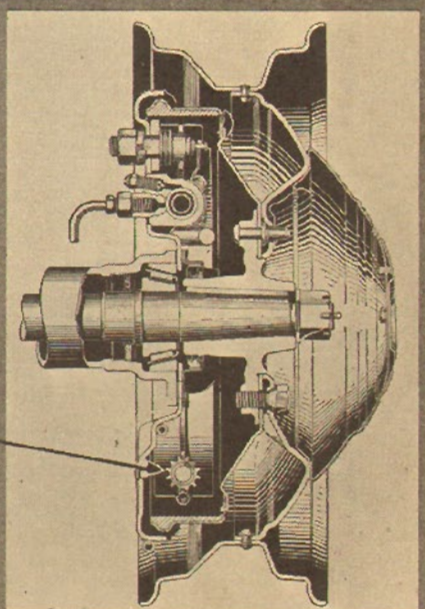
HAND BRAKE ADJUSTMENT: Jack up rear wheels. With equalizer against stop and lever fully released, eliminate slack from lever cable by adjusting clevis at equalizer end. Remove clevis pin from equalizer end of each brake pull cable. Expand rear shoes by turning star wheel adjuster until each wheel can just be turned by hand. Set hand lever in first notch. Place equalizer bar at right angle to frame side rails. Adjust length of each pull cable so clevis pin enters freely without moving equalizer bar. Release hand brake lever. Back off star wheel adjuster until both wheels are free of drag. Test for equalization, back off star wheel adjuster at tight wheel.

MAJOR ADJUSTMENT: Necessary whenever shoes are relined or proper wear adjustment cannot be obtained. Insert .010" feeler gauge between lining and drum at lower end of secondary shoe (rear shoe) and turn eccentric towards front of car until gauge is firmly gripped. Tighten eccentric lock nut. Loosen anchor lock nut one turn. Insert .010" feeler between lining and drum at upper end of secondary shoe and turn anchor in desired direction until gauge is firmly gripped. Holding this position, tighten anchor lock nut securely with 16" wrench. Expand primary shoes by turning star wheel adjuster until slight drag is felt and then back off until drum is just free when turned.

BLEEDING: Should main line or master cylinder be disconnected, system must be bled at all four wheels. When disconnected at one wheel, that wheel cylinder ONLY must be bled. Master cylinder reservoir must be full before bleeding operation is started.

To bleed, remove screw from bleeder connection and attach bleeder tube. Free end should be hanging in clean glass jar partially filled with brake fluid. Open bleeder valve ¾ turn, depress pedal slowly, and allow to return slowly. Continue this action until fluid flowing from tube is solid stream free of air bubbles. Close bleeder valve.





PACKARD SHOP NOTES