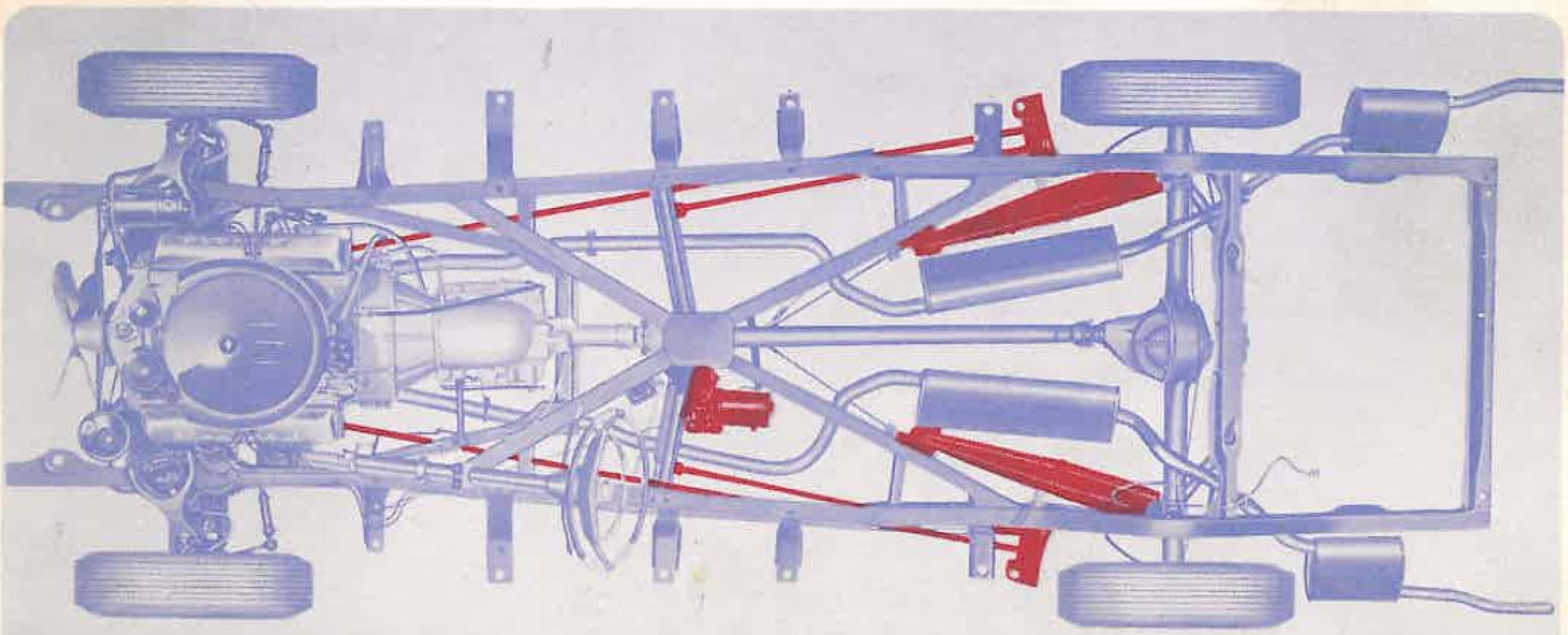
TRAINING PROGRAM

Serviceman's Training Book

THE 55TH SERIES

CLIPPER — PACKARD MECHANICAL CHANGES
and
TORSION — LEVEL SUSPENSION



STUDEBAKER-PACKARD CORPORATION

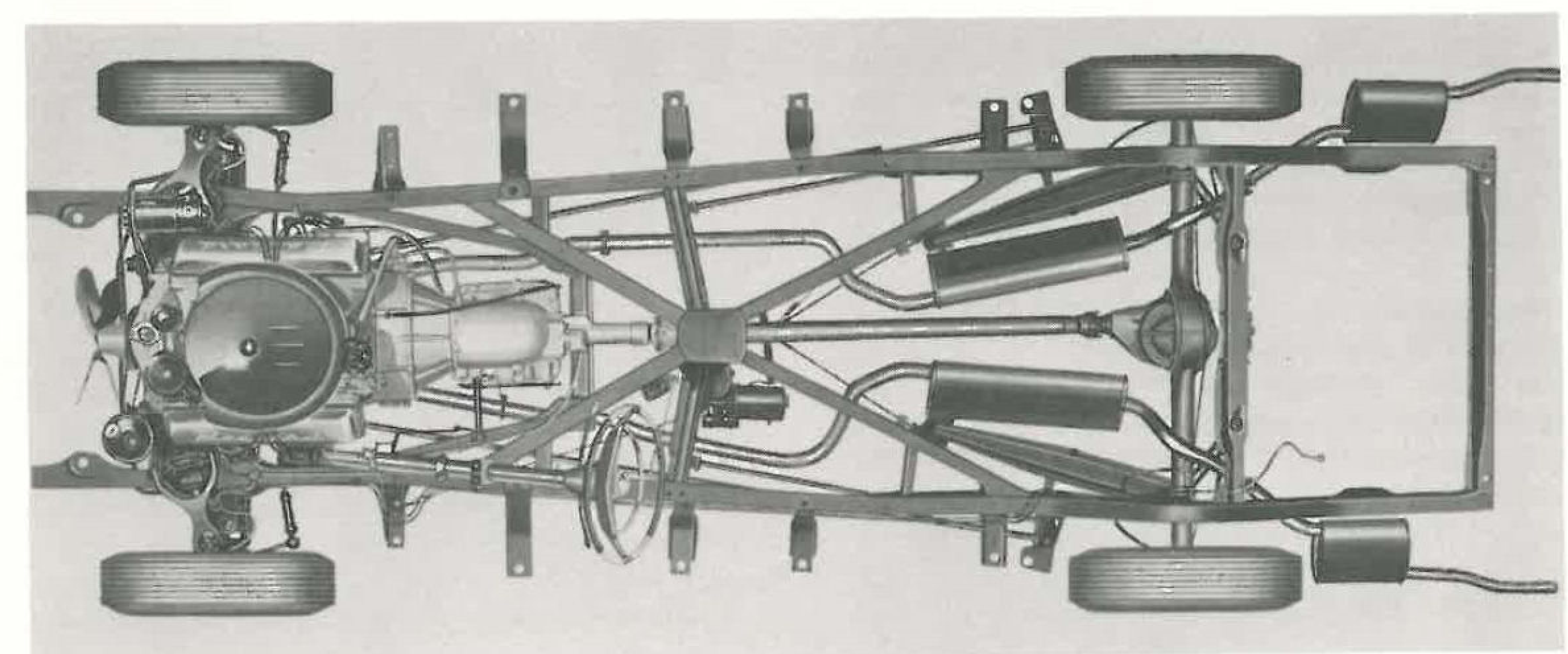
DETROIT 32, MICHIGAN

CONTENTS

55TH SERIES CHASSIS AND BODY SYMBOLS

		CLIPPER DELUXE	CLIPPER SUPER	CLIPPER CUSTOM	PACKARD
		320 Cu. In. 4 BBL.		352 Cu. In. 4 BBL.	352 Cu. In. 4 BBL.
CHASSIS SYMBOLS		5540		5560	5580
BODY TYPES	Pass				
SEDAN	6	5522	5542	5562	5582
HARD TOP	6		5547	5567	5587
CARIBBEAN	6				5588
BODY SPACE			98"		103"
WHEEL BASE			122"		127"
OVERALL LENGTH			214 13/16"		217 7/16"

THE NEW 55th SERIES CLIPPERS AND PACKARDS



Introduction

It is not the intention of this booklet to give all the detailed information and service procedures, but rather to familiarize the Packard Serviceman with the 55th Series line, its major mechanical changes, including preliminary service operations.

Description

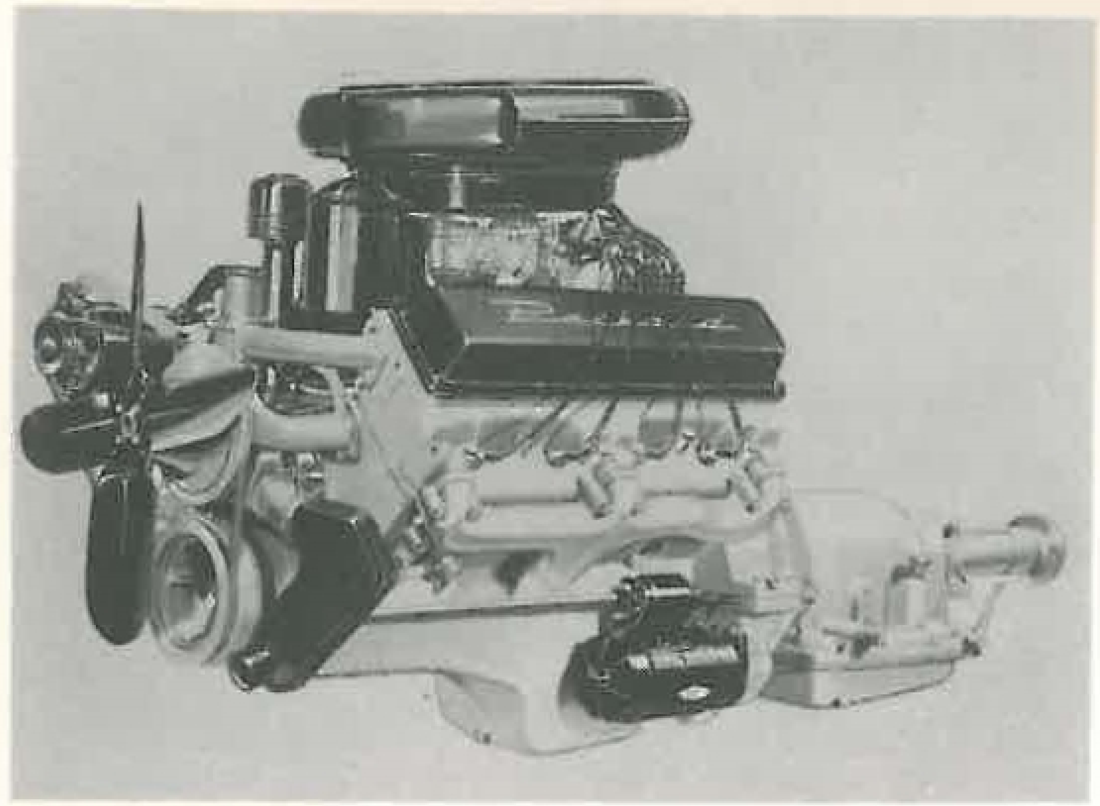
Let us take a good look at the highlights of the 55th Series Cars. There are two different wheel base lengths. The Clipper line is on the 122" wheel base and the Packard line is on the 127" wheel base.

Body Types

Eight different body types are available in the new 55th Series cars. A six passenger four door sedan (5522) is available in the Clipper Deluxe Model. A six passenger four door sedan (5542) and a six passenger two door hard top (5547) Panama is available in the Clipper Super Model. A six passenger four door sedan (5562) and a six passenger two door hard top (5567) Constellation is available in the Clipper Custom Model.

Three body types are available in the Packard line. A four door six passenger sedan (5582), a six passenger two door hard top (5587) and a six passenger two door Caribbean (5588) Convertible.

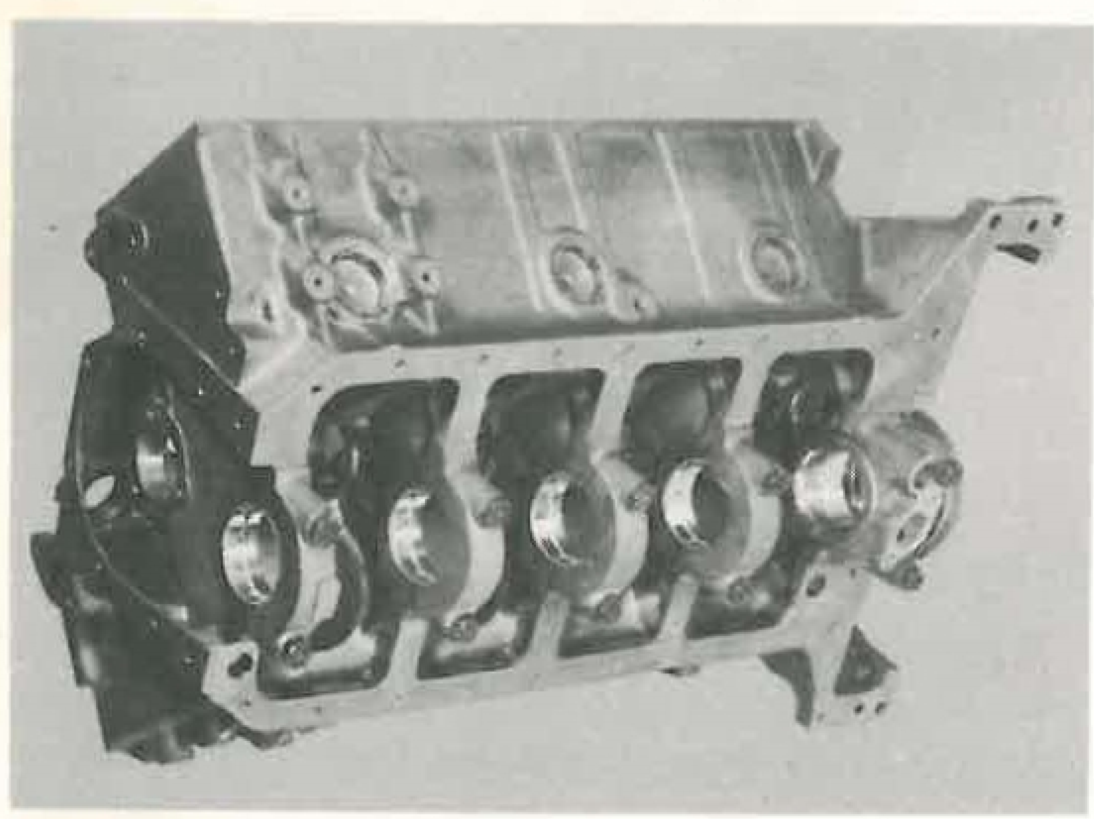
THE V-8 ENGINE



Description

To follow Packard's respected predecessors, the new Packard V-8 was designed to be superior to any V-8 engine built to date. It has compactness and lightweight, greatest possible structural strength and rigidity, appropriate bore to stroke ratio to obtain the greatest mechanical and thermal efficiencies, inherent smoothness and silence as well as simplicity of design for maximum life.

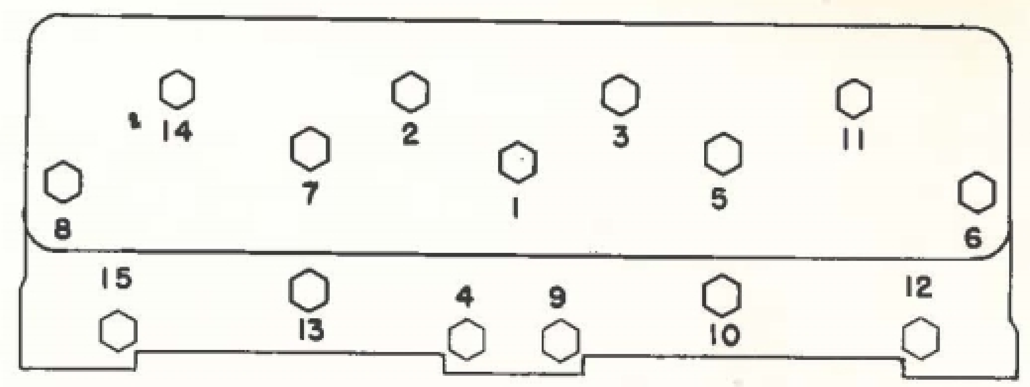
The new V-8 engines are of two displacement sizes. The 5540 chassis is powered by a 320 cu. in. engine with a bore of $3\frac{13}{16}$" and a $3\frac{1}{2}$" stroke. The 5560 and the 5580 chassis are powered by a 352 cu. in. engine with a bore of 4" and a $3\frac{1}{2}$" stroke.



Cylinder Block

The new Packard V-8 cylinder block and crankcase are an integral (one piece) casting of fine iron alloy, designed for maximum structural strength and rigidity. Crankcase walls are reinforced by five rugged and heavily ribbed crankcase webs which support the camshaft and crankshaft as well as wall reinforcing ribs and oil pan bolt bosses integrally cast into the crankcase.

The cylinder bores are completely surrounded over their full lengths by the cooling water. The cylinder walls are attached only at their ends to the crankcase and the cylinder block upper (deck) to which the cylinder head mates. Cylinder head attaching bolt bosses are cast along the cylinder block outside walls to prevent cylinder distortion from the cylinder head bolt tension. Each cylinder head is attached by 15 cap screws, providing five cap screws spaced uniformly around each cylinder bore. This arrangement permits the use of a thin all-steel cylinder head gasket for excellent heat transfer between cylinder head and block. Pressed ridges in the gasket around each cylinder bore and water passages prevents leakage in these areas.



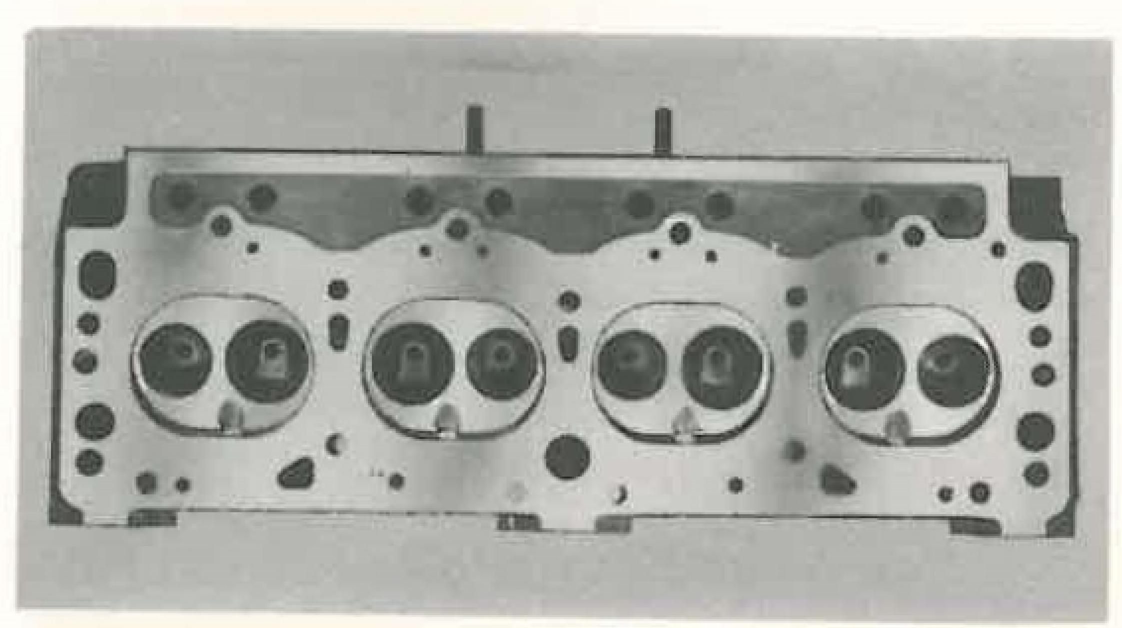
VIEW OF CYLINDER HEAD SHOWING SEQUENCE FOR TIGHTENING CYLINDER HEAD BOLTS

CYL. HEAD TORQUE 55-60 FT. LBS.

The cylinder blocks are so engineered, that while the model 5540 has a bore of $3\frac{13}{16}$" and the models 5560 and 5580 have a 4" bore, the cylinder heads, camshaft, connecting rods and bearings are interchangeable.

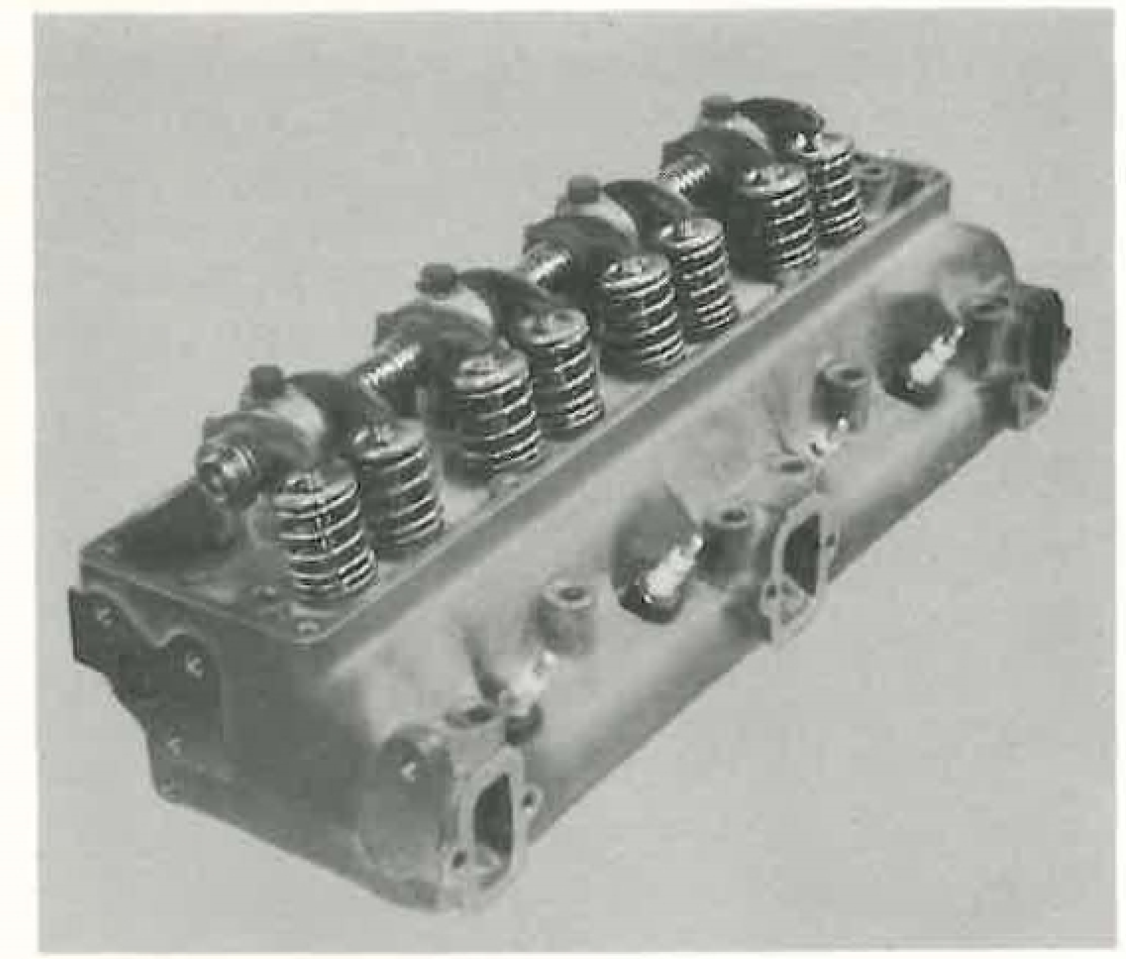
Cylinder Head

The cylinder heads are an iron alloy casting of deep rigid construction. They are designed to be symmetrical so that the left head is interchangeable with the right head.



The machined combustion chamber of 'elliptic' or 'parabolic' shape was selected after extensive testing because of its many advantages over any other combustion chamber design. The compression ratio is 8.0:1 on model 5540 and 8.5:1 on models 5560 and 5580. The

combustion chambers of relatively large quench area design, provides high turbulence which in effect gives more efficient burning of the fuel and air mixture. Because of the thermal efficiency of the engine, the cooling system requirements are 15% less than the 1954 models.



This design provides ideal spark plug location, and the side-by-side valves make possible the use of a short, lightweight, compact valve train with the minimum of inertia and deflection. This type of cylinder head and valve train design permits sustained full power operation, without power losses due to valve train lag.

Another important design advantage of the Packard cylinder head is the integral valve guides. By casting the long valve guides as an integral part of the cylinder head makes it possible to reduce the valve operating temperatures by as much as 200°F. at the valve head, and as much as 100°F. at the valve stem.

Valves

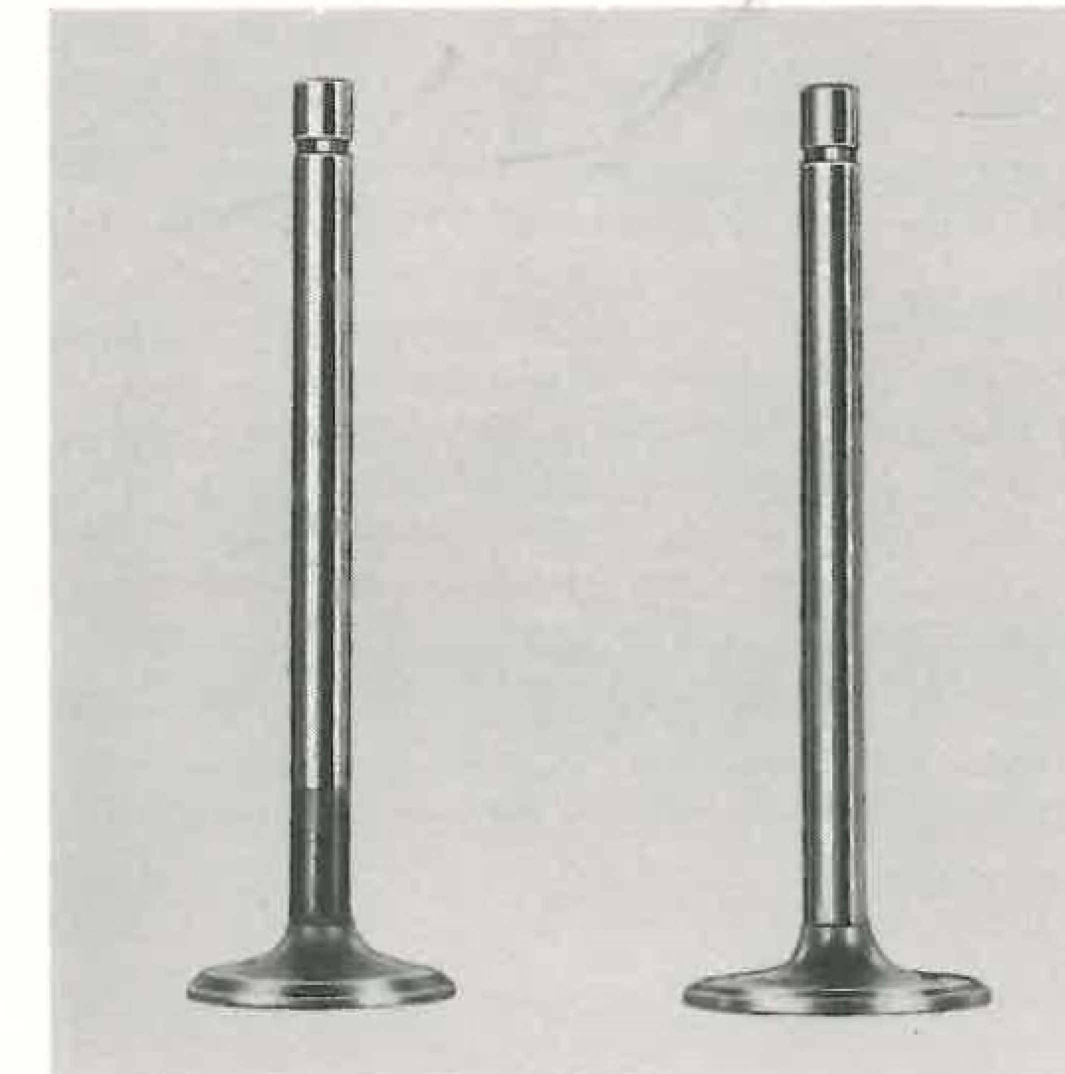
The larger bore and short stroke design of the engine has another advantage in addition to reducing piston speed.

The larger bore permits the use of valves with larger head diameters and larger valve ports, which provide improved breathing advantages.

The intake valves are made of Silicrome Steel, hardened and tempered all over.

The exhaust valves of flexible head design, are made of high grade Austenitic Steel, which readily conforms to the shape of the seat and are highly resistant to burning and pitting.

Neoprene valve spring seals are fitted to both intake and exhaust valve spring seats to control the amount of oil permitted to lubricate the valve stems and integral guides. This prevents excessive oil from entering the intake and exhaust ports, and consequently, prevents exhaust smoke, normally caused by oil in other



overhead valve type engines that do not have seals.

The valve train consists of the chain driven camshaft, located in the 'V' of the block, stub type hydraulic tappets, lightweight tubular valve push rods, short sturdy rocker arms, a rocker shaft on each head and supports. The whole valve train was carefully designed to give the minimum of inertia and resultant lag.

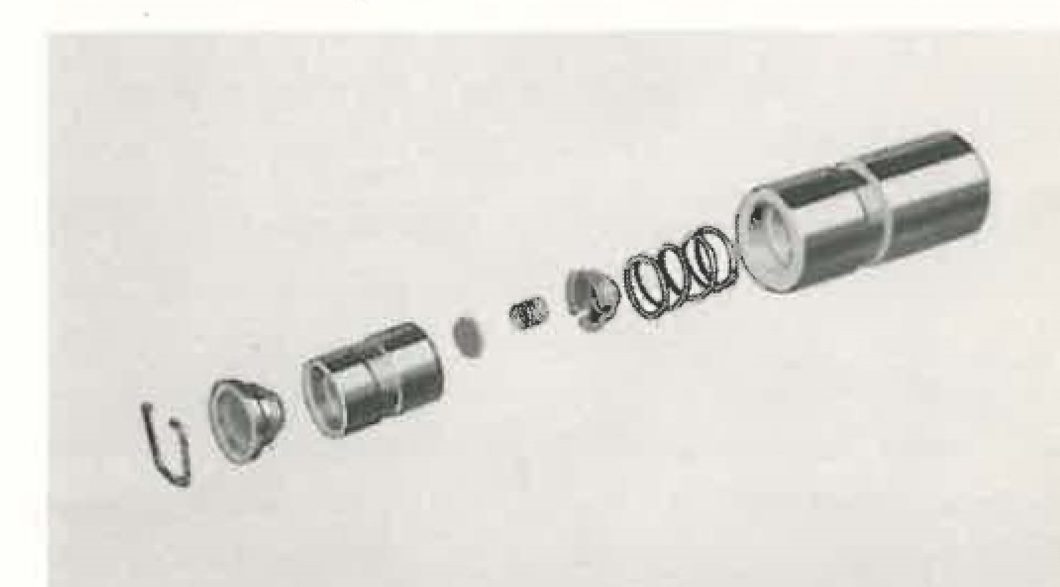
The upper side of the cylinder head has a smooth machined high wall, to which the rocker cover is attached by seven cap screws, compressing a thick cork gasket to provide a suitable seal against oil leakage. The high wall (or ridge) and specially formed drain channels around the stud bosses prevents the formation of oil puddles, thereby reducing the tendency of oil leakage.

Worn valve guides can be reamed for oversize valve stems which come in four oversizes: .003", .010", .020". .030".

Hydraulic Valve Tappets

Hydraulic valve tappets are used in both V-8 engines. The tappets will be serviced as assemblies, although they can be removed and disassembled for cleaning.

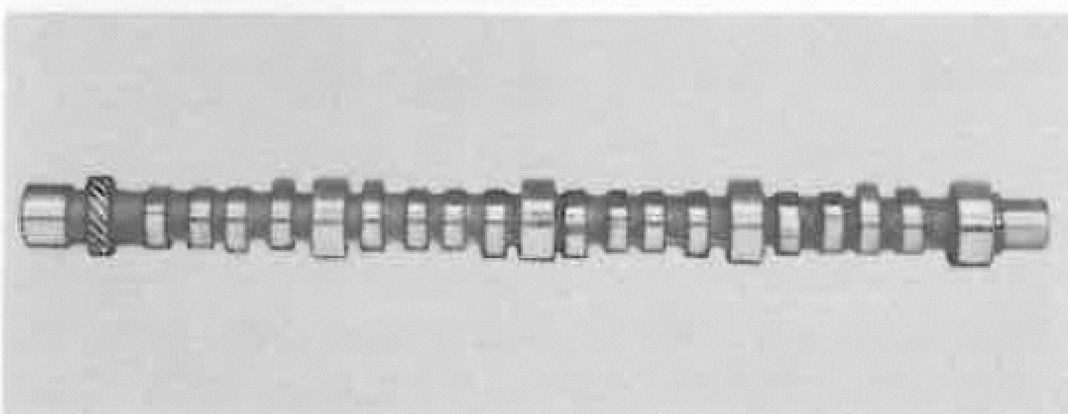
In order to remove the tappets the following will be removed first; valve rocker lever covers, carburetor,



intake manifold, tappet covers and baffles. Remove the rocker lever mounting bolts, freeing the rocker levers and shafts. The push rods then can be removed and the tappets then lifted out.

Camshaft

The new Packard V-8 engine camshaft is an iron alloy precision casting, with the cams cast as an integral part of the camshaft. The contour or the shape of the cams is so designed, that it gives the valve the longest period of wide opening, and quiet operation in valve opening and closing. The cams and bearing surfaces are hardened by a special heat treating process, which reduces wear to a minimum. Five steel-backed precision type babbitt bearings support the camshaft in the main bearing webs in the block.



Stub type hydraulic tappets are used to insure quiet operation. The cam lobes are ground with a slight taper, and the tappet face has a large spherical radius to provide controlled slight tappet rotation to eliminate spot wear in the tappet face.

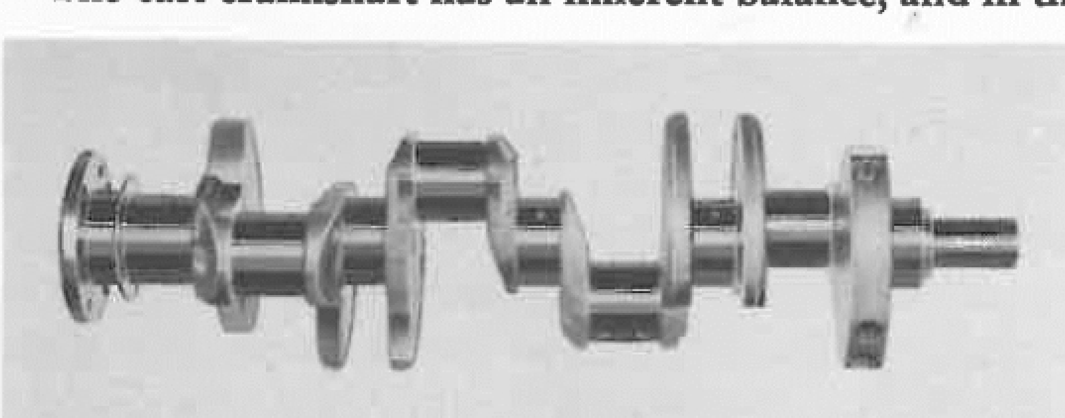
The camshaft is driven by a silent chain of one inch width. The camshaft sprocket is made of hardened cast iron, while the crankshaft sprocket is of hardened steel alloy. A hard chrome finish stamped steel eccentric attached to the front end of the camshaft actuates the fuel pump arm.

The driving chain and sprockets are enclosed in a housing formed in the cylinder block casting. A die cast cover encloses the driving chain housing and supports the fuel pump.

Crankshaft

The new Packard V-8 engine crankshaft is a steel alloy precision casting. This shaft has six integral counterweights, located where they are most effective. This is possible since the counterweights in a cast shaft are not limited to a single plane as in a forging process.

The cast crankshaft has an inherent balance, and in the



manufacturing process the crankshafts are mass balanced with the flywheel, connecting rods and pistons. This method of balancing prevents a stack up of tolerances of the component parts.

On Model 5540, the crankshaft operates in five precision steel-backed babbitt lined bearings. On models 5560 and 5580 (number 1, 2, 3 and 4 main) bearing material is copper-lead alloy, the number 5 rear main is babbitt lined. The bearings are supported by the sturdy heavily-ribbed transverse webs in the cylinder block crankcase. Two oil galleries and drilled passages in bosses in the crankcase webs provide full pressure lubrication to the crankshaft main and camshaft bearings.

An accurately machined and balanced cast iron flywheel is used with the conventional clutch and transmission, while a precision ground and balanced pressed steel flywheel is used with the Twin Ultramatic Transmission. A steel starter ring gear is pressed on the cast iron flywheel, and is welded on the pressed steel flywheel. The flywheel is attached to the crankshaft by six self locking cap screws.

Three undersize bearing sizes are available: .001″, .002″, .020″, Numbers 1, 2, 3 and 4 bearings are interchangeable. Number 5 bearing takes the crankshaft thrust. The limits for end clearance is .0035″–.0085″. The main bearing diametral clearances are .0005″–.0025″. The main bearing caps are numbered and are marked with the word *front* to facilitate assembly.

Connecting Rods

The connecting rods are drop forged of high grade manganese steel, and are of a sturdy "I" beam construction. The short length and the design of the rods helps to reduce their weight to a minimum, which is desirable of any high performance engine. Balancing lugs are provided at each end of the connecting rod assembly.

A hard-rolled bronze bushing in the upper end is provided as a bearing for the piston pin. It is diamond bored for true fit and center accuracy. An accurately located groove in the lower end of the connecting rod, at the split line, provides adequate lubrication for the cylinder wall and piston pin, by a metered spray and deflection from the cylinder wall. The connecting rod bearings are of the finest precision removable type. They are steel shells lined with a lead babbitt alloy material. The connecting rod bearings are lubricated by full pressure, through drilled passages in the crankshaft from the main bearing journals to the crankpin.

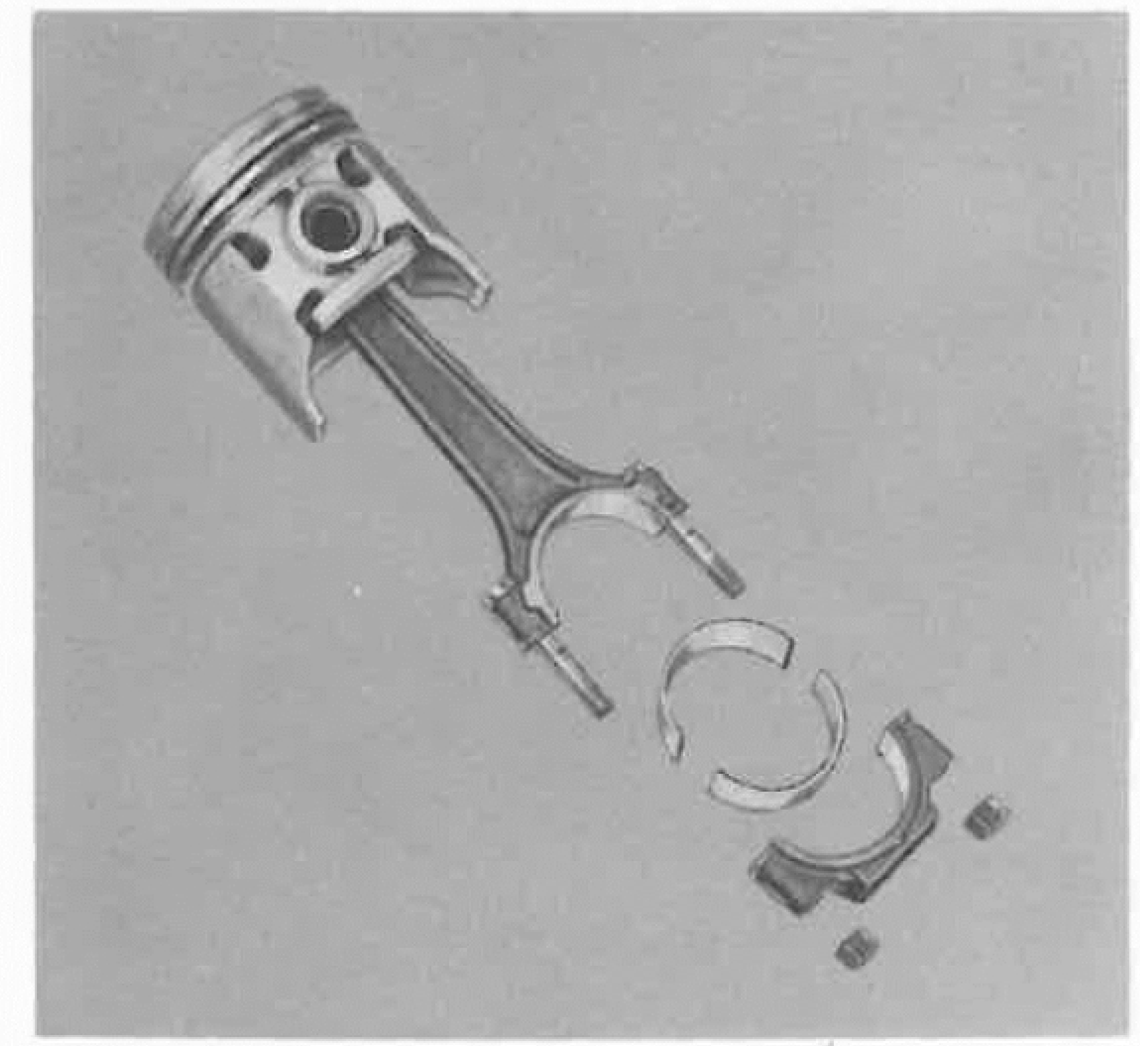
There are three undersize bearings available: .001, .002, .020. The numbers on the connecting rods go to the outside of the block. The oil squirt notches go toward the camshaft. The connecting rod to crankshaft diametral clearances are: .0005″ to .0025″.

Pistons and Rings

Aluminum alloy slipper-type pistons are used. These

pistons are cam-ground and have steel struts to control expansion. Uniform cylinder wall clearance is maintained through all engine operating temperatures.

The pistons are surface treated and tin plated to provide ideal bearing material. The weight variations among the pistons are maintained below 14/100 of an ounce. Packard precision machining assures uniform cylinder bore fit. The piston pin bores are diamond bored at uniform temperature to provide perfect, uniform, piston pin fit. The piston pin is held in place by steel piston pin retainers.



Three piston rings are used on each piston, two compression rings in the upper ring grooves, the top compression ring being plated with hard chrome, and one special type oil ring in the lower ring groove. All three rings are above the piston pin. The special ring combination provides an excellent compression seal and oil control, with greatly reduced cylinder wall pressure.

Oversize pistons are available for both V-8 engines in sizes: .010″, .020″, .030″. The piston bosses have a stamped "F" which when assembled goes to the front of the engine.

A notch on top of the piston head is used as a guide to assemble the piston to the rod. The notch always goes to the front of the engine.

Piston Ring Installation

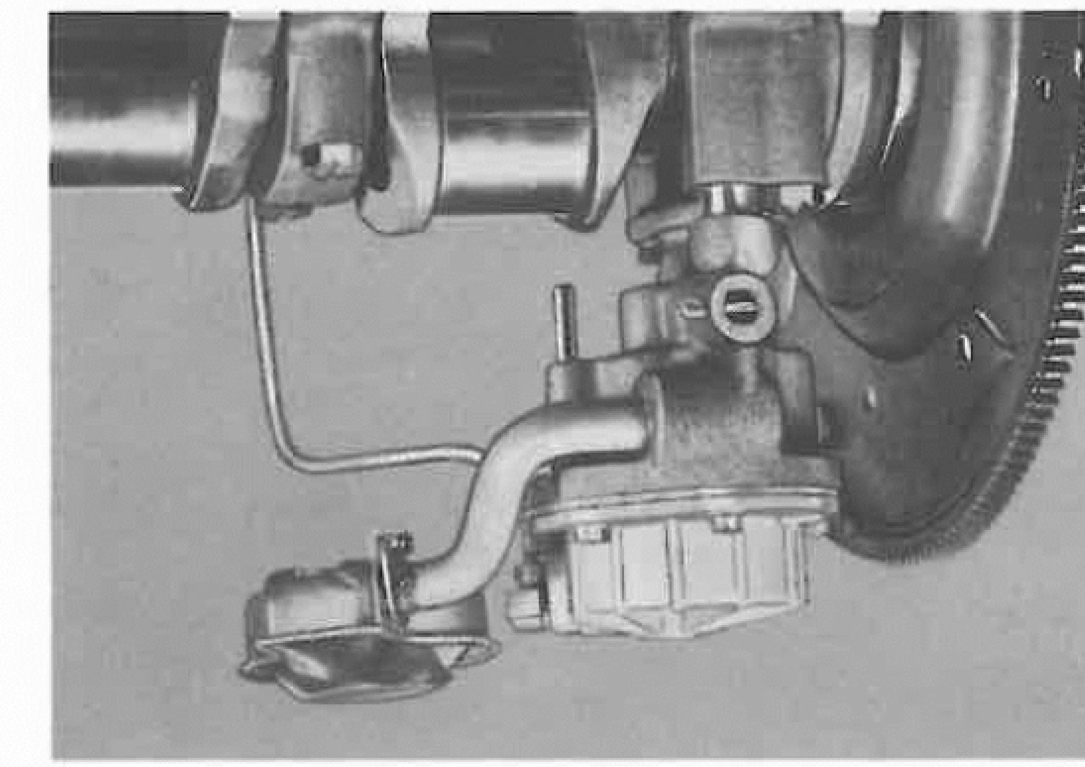
Install the chrome ring in the first groove. Install the first and second ring with mark 'top' toward the top of the piston. The gap of the first and second ring is .013″–.025″. The gap in the oil ring is .013″–.023″. Place the gap of the top and oil ring toward the camshaft side of piston (both banks). Place gap of second ring opposite camshaft side of piston (both banks). All gaps to be midway between piston pin bosses.

Piston Pins

Piston pins are available in two oversizes: .003 and .006. Piston pins are a hand push fit in the piston at 160° and a push fit in the rod, at room temperature.

Engine Oiling

All vital moving parts of the new Packard V-8 engine are pressure lubricated. The oil supply is carried in the five quart capacity oil pan.



A gear type oil pump is driven by the distributor shaft gear, which meshes with a gear on the rear end of the camshaft. The oil pump is attached to the lower rear web of the engine block crankcase and operates submerged in the engine oil pan. The oil pump maintains a minimum pressure of 10 p.s.i. at idle, and a maximum of 45 p.s.i. at 40 m.p.h. and above.

A special rotor vane type vacuum pump is located on the lower end of the oil pump. This vacuum pump is driven by the oil pump shaft and provides vacuum for windshield wiper operation at all times the engine is operating, to provide uninterrupted windshield wiper operation, regardless of engine load or operating condition.

The crankshaft main bearings, connecting rod bearings, camshaft bearings, tappets, timing chain and sprockets are fed and lubricated by means of two longitudinal oil galleries and smoothly drilled metered passages in the cylinder block and crankshaft. Cylinder walls are lubricated by spray from an accurately located metered notch at the split line in the connecting rods. The piston pins are lubricated by oil spray deflected from the cylinder wall.

The lubrication of the rocker shafts is supplied from the main oil galleries up through a drilled passage in the cylinder block which mates with a passage in the cylinder head. The hollow rocker shafts also function as oil galleries to supply oil to the rocker arms. Drilled passages in the rocker arms furnish pressure intermittently to the push rod sockets. Oil from the holes of the sockets flows down the rocker arm to lubricate the valve stem.

The oil drains down from the valve train into a trough formed on the top of each cylinder head. Channels around stud bosses prevent the formation of oil puddles. Drain holes at the front and rear of the cylinder heads and passages in the cylinder block permit oil to drain down into the oil pan.

Distributor drive gear lubrication is accomplished by splash, while the distributor shaft bearings are lubricated by gravity feed.

The new Packard V-8 engine is equipped with an externally mounted bypass type oil filter, which filters and cleanses the oil removing dirt, and other impurities.

The filter is externally mounted to make it easy to replace the filter cartridge when dirt accumulation is excessive. The filter is standard equipment on model 5580 and is factory installed optional equipment at extra cost on models 5540 and 5560.

An oil pressure gauge is used on the 5580 model and a light is used for the oil pressure indicator on the 5540 and 5560 chassis.

Removal of Oil Pan

When the occasion arises to remove the oil pan, it will be necessary to drop the steering idler lever and bracket, and remove the starter motor. On the 5540 and 5560 the exhaust pipe cross over will have to be removed. On the 5580 the left exhaust pipe will have to be dropped.

Fuel Pump

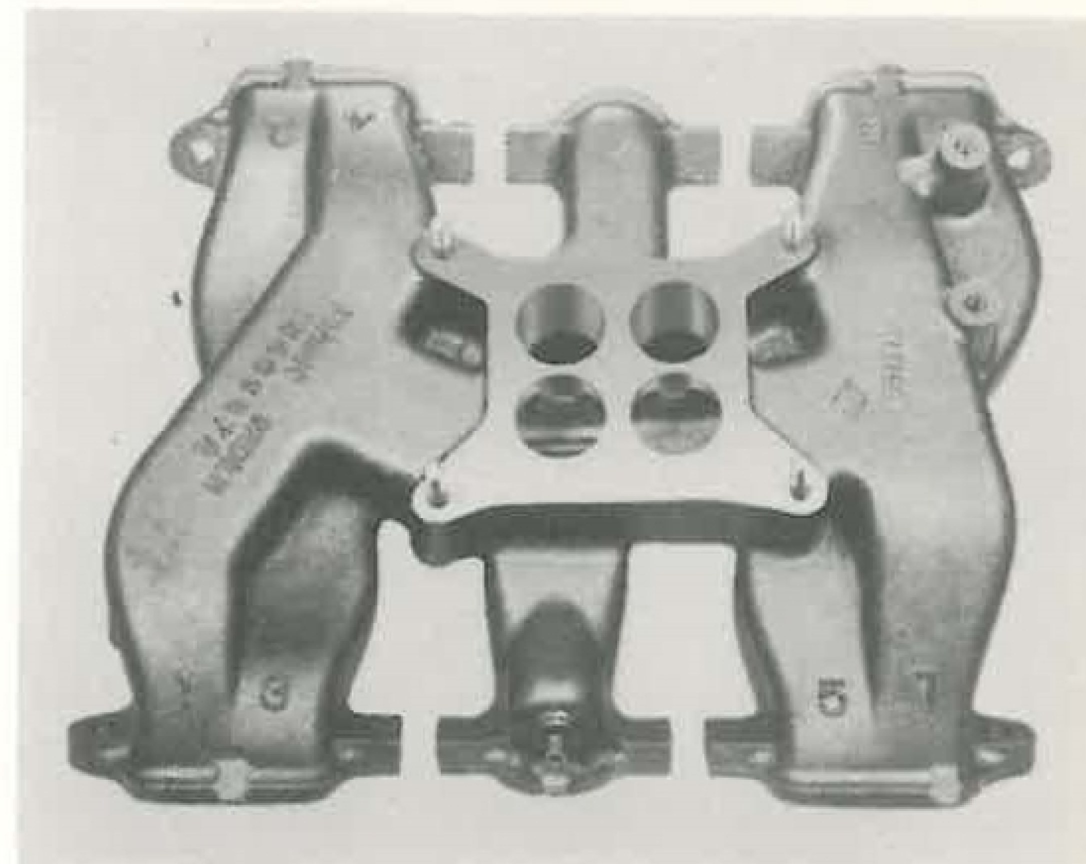
A diaphragm type fuel pump is located at the right forward end of the engine, mounted on a pad of the timing chain cover. The fuel pump lever operates on an eccentric attached to the forward end of the camshaft.

Vacuum Pump

The windshield wiper vacuum pump is now a rotor vane type pump located in the engine oil pan and driven by the engine oil pump driving shaft.

The vacuum connection from the vacuum pump emerges from the side of the right cylinder block just ahead of the oil dip stick tube.

Intake Manifold



The new Packard V-8 intake manifold is an iron alloy casting, and incorporates carefully calculated intake manifold passages, which provides for uniform distribution and least restriction in the intake passages. The individual manifold branches for each cylinder are of equal cross section area throughout their full length. They are arranged in a level horizontal plane at their mating areas with the cylinder head intake ports.

Vertical risers for the four barrel carburetor are connected independently to the longitudinal passages feeding the cylinder branches. The cross-over to the longitudinal passages is accomplished by over and under passages which have a smooth inside contour with liberal radii to provide the minimum of restriction to air flow.

During warm-up exhaust heat from the left bank exhaust manifold is routed through a head cross over passage in the intake manifold through the heat riser passages surrounding the vertical carburetor risers in the manifold. It is then discharged into the right bank exhaust manifold and through the exhaust system.

A thermostatically controlled butterfly type valve at the outlet adapter of the left bank manifold, controls the amount of exhaust heat admitted to the heat riser in the intake manifold.

Exhaust System

The exhaust manifolds are three port iron alloy casting with liberal sized passages for least exhaust back pressure.

Model 5580 has a dual exhaust system. An individual exhaust pipe, muffler, resonator, and tail pipe for each cylinder bank. The tail pipe exhaust is carried through an outlet in each end of the rear bumper impact bar. The dual exhaust system is available as special equipment at extra cost on model 5560.

On models 5540 and 5560, a single exhaust system is located along the right side of the frame side rail. A cross over tube located under the front portion of the engine oil pan, is used to connect the left bank manifold to the common exhaust pipe on the right side.

The mufflers used are of the reverse flow type to provide adequate silencing.

Cooling System

The new Packard V-8 cooling system consists of a tube and fin type radiator, centrifugal water pump, plate type unit transmission fluid cooler, capsule type thermostat and the necessary hoses and clamps. The cooling system has a 26 quart capacity, exclusive of the car heater.

The new radiator core has a square broad frontal area which exposes the fins and tubes to the oncoming air while driving. The new radiator tanks are of the lock seam joint which gives greater strength to the tanks.

The new V-8 engine water pump has a single inlet, but discharges into an equalizing outlet manifold with dual outlets, which feeds a balanced flow to both cylinder banks. The coolant is directed through the cylinder block, around each individual cylinder barrel to the water passages in the rear portion of the block, where it

crosses into the cylinder head, and reverses its direction. It flows through the generous passages around the combustion chambers, valve ports, valve guides, and spark plugs. The short exhaust passages in the head reduce the heat rejection to a minimum. The coolant is returned to the radiator through an outlet at the forward end of the cylinder heads, and the water outlet manifold cast integrally with the pump body.

A capsule type thermostat, whose operation is unaffected by cooling system pressures, is located in a housing at the center of the water outlet manifold.

Fan Belt Tension

With generator mounting bolts and adjusting strap bolts loose; adjust to 25 ft. lbs. at pivot bolt with torque wrench or 50 lbs. pull in direction of adjusting slot, using a scale.

THE 12 VOLT ELECTRICAL SYSTEM

Description

The development of the new V-8 engine with its greater torque and horsepower dictated the need for an improved electrical system. To fill these needs the 12 Volt System provides: (1) better ignition performance to handle the rise in compression ratios, (2) better generator performance—to handle the increasing electrical loads, (3) provides better cranking motor performance—to provide fast trouble-free starting and (4) improved electrical distribution.

The Auto-Lite electrical system is used on the 5540 chassis. The Delco-Remy electrical system is used on the 5560 and 5580 chassis.

Generator

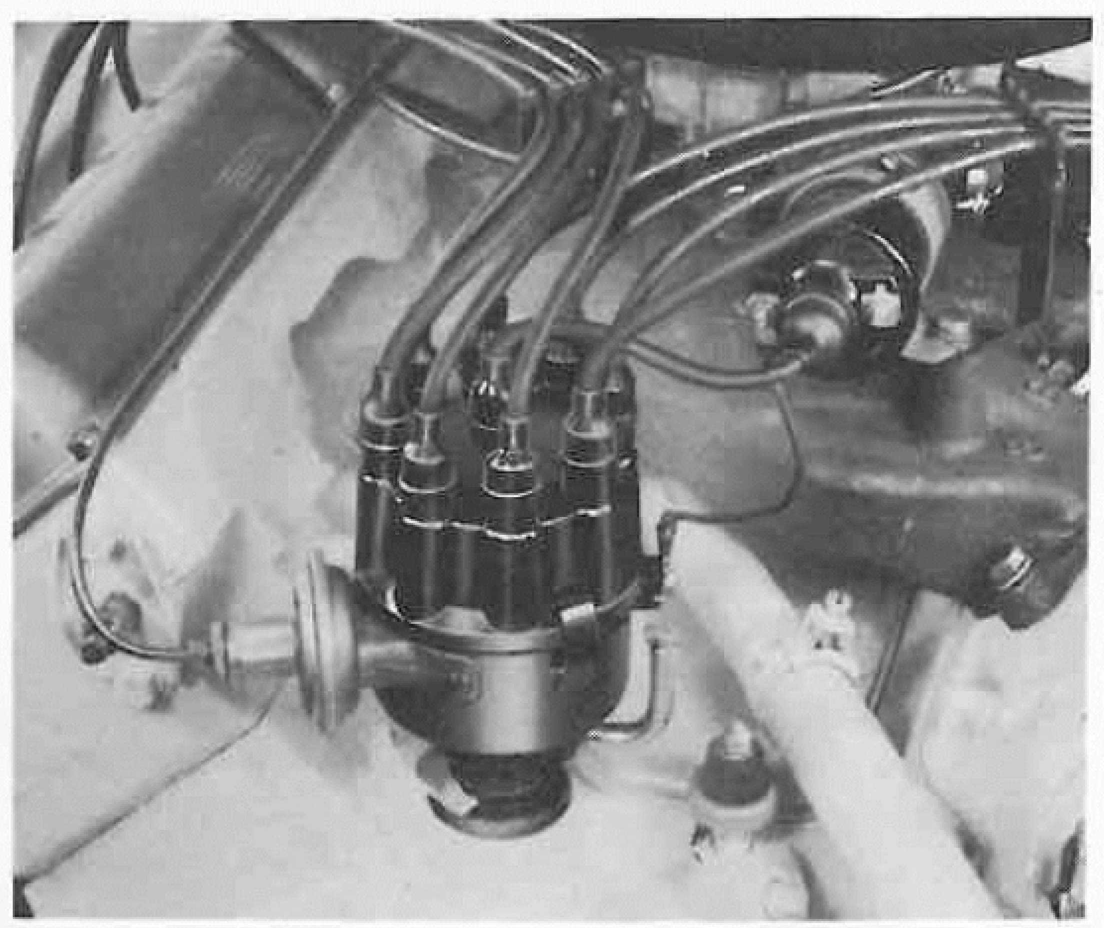
The generator is mounted on a bracket attached to a special boss at the forward end of the right exhaust manifold and is driven by a belt from the crankshaft pulley. A 12 volt, two brush shunt wound generator is used on all models. The armature in each of these generators is supported by a ball bearing in the drive end frame and by a porous bronze bushing in the commutator end frame. The generator is cooled by a fan mounted on the drive end. The installation on all models uses a 12 volt 30 ampere generator. The cut-in-speed of this generator has been lowered, it has the ability to keep the battery fully charged even at low car speeds. It has a maximum output of 520 watts. A charging indicator light on the instrument panel is used for the 5540 and 5560 models, for the 5580 a charging indicator gauge is provided.

Regulator

The generator output is controlled by a current and voltage regulator. The regulator is designed for use with a positive grounded battery and a shunt type generator. The regulator contains a cutout relay, a voltage regulator unit, and a current regulator unit. It is serviced the same as the 6 volt regulator, but the 12 volt specifications must be followed and 12 volt testing equipment must be used.

In checking the electrical charging system and providing the generator passes its tests, the voltage regulator may require adjustment, if the battery remains undercharged or uses too much water.

Distributor



The distributor which is mounted at the rear end and in the V of the engine is a 12 volt, 8 cylinder single breaker type unit. The distributor has two separate advance mechanisms, a vacuum advance and a centrifugal advance. A vacuum control unit is mounted on the outside of the distributor housing.

Delco Specifications

Breaker Point Gap Clearance: .016"
Spring Tension: 19-23 ounces
Cam or Dwell Angle: 26° to 33°
Automatic Advance (Crankshaft degrees)
0° at 800 RPM (Eng)
31° at 4200 RPM (Eng)
Vacuum Advance (Crankshaft degrees)
Start
0° at 6 in. Hg.
20° at 12½ in. HG. Max.

Auto-Lite Specifications—IBJ-4001A

Breaker Point Gap Clearance: .016"
Spring Tension: 17-20 ounces
Cam or Dwell Angle: 27°
Automatic Advance (crankshaft degrees)
0° at 600 RPM
2° at 650 RPM
22° at 1200 RPM
38° at 2270 RPM
40° at 2400 RPM
Vacuum Advance (Crankshaft Degrees and Inches of Mercury)
Start 0° at 6" Hg.
2° at 6¾" Hg.
6° at 9¼" Hg.
8° at 8⅞" Hg.
11° at 10" Hg.

Timing Marks

Timing marks are located on the camshaft driving chain cover and is marked 0°-5°-10°-15°. On the crankshaft pulley is a notch which is used in conjunction with the marks on the cover for timing. The ignition timing is 5° BTDC.

The firing order and cylinder numbering is located on the intake manifold.

Installation of Distributor

When removing the distributor for servicing, the position of the rotor to the housing should be noted and the rotor placed in the same position when the distributor is installed. In case the engine crankshaft was rotated with the distributor removed the following procedure will be necessary.

Rotate engine crankshaft until No. 1 cylinder (front left bank) is on TDC firing stroke. Place the gasket on the distributor shaft, and with the distributor cap removed insert the distributor to engage the oil pump drive shaft by turning the distributor rotor. Select the proper tooth so that when the distributor gear is in full mesh with the camshaft gear the position of rotor will be on No. 1 terminal.

After distributor is in its bottom position install the retainer clamp, washer and screw. Connect the vacuum advance tube to the fitting on the distributor, and connect wire lead. Install the distributor cap and snap the two spring hooks in place on the cap. For setting the timing the procedure is the same as in the past.

Ignition Coil and Ignition Resistor

The ignition coil is hermetically-sealed unit designed specifically for use with an external resistor in the 12 volt system. The improved ignition performance of the 12 volt system is largely the result of this new design.

The external resistor, connected in series with the primary circuit between the battery and coil, increases coil efficiency by dissipating nearly half the heat which otherwise would be generated within the coil itself.

The resistor is wound with wire which changes resistance only slightly with temperature. This characteristic prevents excessive primary current at low temperatures and thus reduces the tendency for the contact points to oxidize in the cold weather.

To obtain greatly improved starting performance at low temperature, the resistor is by-passed during cranking, thereby connecting the ignition coil directly to the battery. The by-passing of the resistor during cranking is accomplished by the use of a "finger" within the solenoid.

CAUTION: Since the ignition switch is by-passed during cranking the coil secondary cable must be disconnected, or the primary terminal of the distributor must be grounded while making underhood cranking motor tests to prevent engine firing. The resistor is attached to the firewall on the right side just above the heater.

Spark Plugs

The spark plugs are of a new special design and body length, the spark plug size is 14mm long body and the gap is to be set at .035" plus or minus .001". Champion H10 plug is used on both engines. The spark plug torque is 26 to 30 ft. lbs.

CARTER CARBURETOR—MODEL WCFB 2232S

The 4-barrel Carter Carburetor Model WCFB 2232S is used on all Clipper Deluxe and Clipper Super Models (5540).

Servicing this carburetor is identical to the instructions released for the 26th Series 4-barrel carburetor "WCFB Model 985S." See Service Counselor Vol. 27, January, 1953 and Serviceman's Training Book "Packard 4-Barrel Carburetor."

All adjustments are made in the same manner, however; a few measurements are changed slightly and are listed for your information:

1. Primary float level—1/8"
   Secondary float level—5/32"
   Primary float drop—1/2"
   Secondary float drop—1 7/32"
2. Bowl vapor vent adjustment—1/16"
3. Unloader adjustment—3/16"

ROCHESTER CARBURETOR—MODEL 4GC

The 4-barrel Rochester Carburetor Model 4GC is used on all 1955 Clipper Custom and Packard Models (5560 and 5580).

It consists basically of two dual carburetors and is divided into a Primary Section and a Secondary Section. The Primary Section controls the metering to the engine throughout the idle and part throttle range. The fuel from the Primary Section is supplemented by fuel from the Secondary Section throughout the power or wide open throttle range.

However, this carburetor incorporates many new and distinctive features which provides smooth outstanding performance in all ranges.

1. The idle system supplies fuel from openings below all 4 throttle valves which provides an even mixture to all cylinders.
2. The power system is vacuum operated. In this way proper power mixtures are readily available upon a drop in manifold vacuum, regardless of the degree of throttle opening, therefore, it is not necessary to open the throttle completely to enrich the mixture for power operation.
3. The accelerator pump employs the use of a vented type pump plunger. By means of a vent ball in the plunger, fuel vapors pass from the pump well to the float bowl. This insures that the pump well will be primed with solid fuel at all times for rapid acceleration.

ROCHESTER CARBURETOR ADJUSTMENTS—MODEL 4GC

It is important that the following adjustments be performed in the exact sequence given:

1. Both sets of floats are adjusted in the same manner and to the same dimensions. Place the air horn assembly in an inverted postion on a flat surface, leave the air horn gasket in place while adjusting the floats:

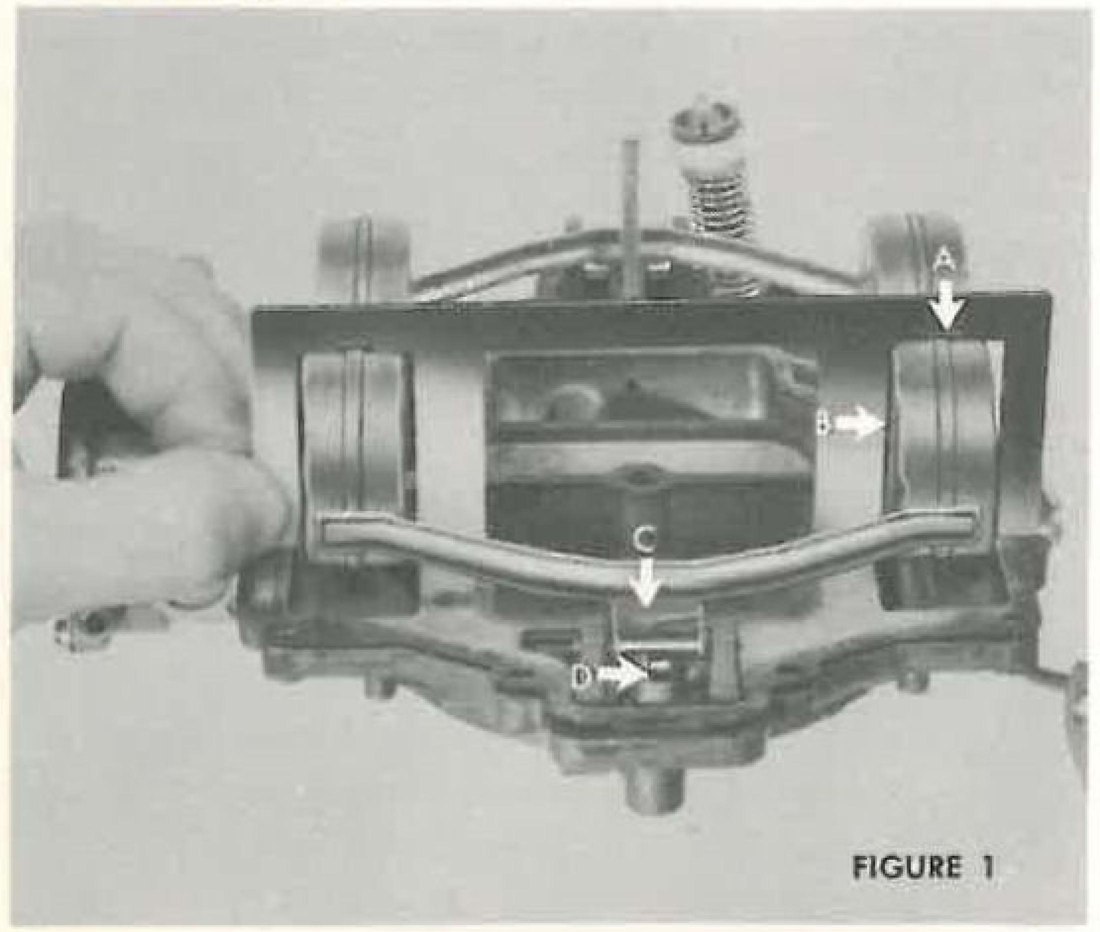


FIGURE 1

a. Float Level: Place float level gauge J-5399 in position as shown in Fig. 1. Lift the floats until the needle is seated. The floats should just touch the top portion of the gauge "A," bend float arms at "C" as required. (The scale dimension from the bottom of floats to the air horn gasket should be $1\frac{5}{8}$".)

b. Float Alignment: With gauge in position, the float arms should be bent sideways until each float is centered between the gauge legs "B."

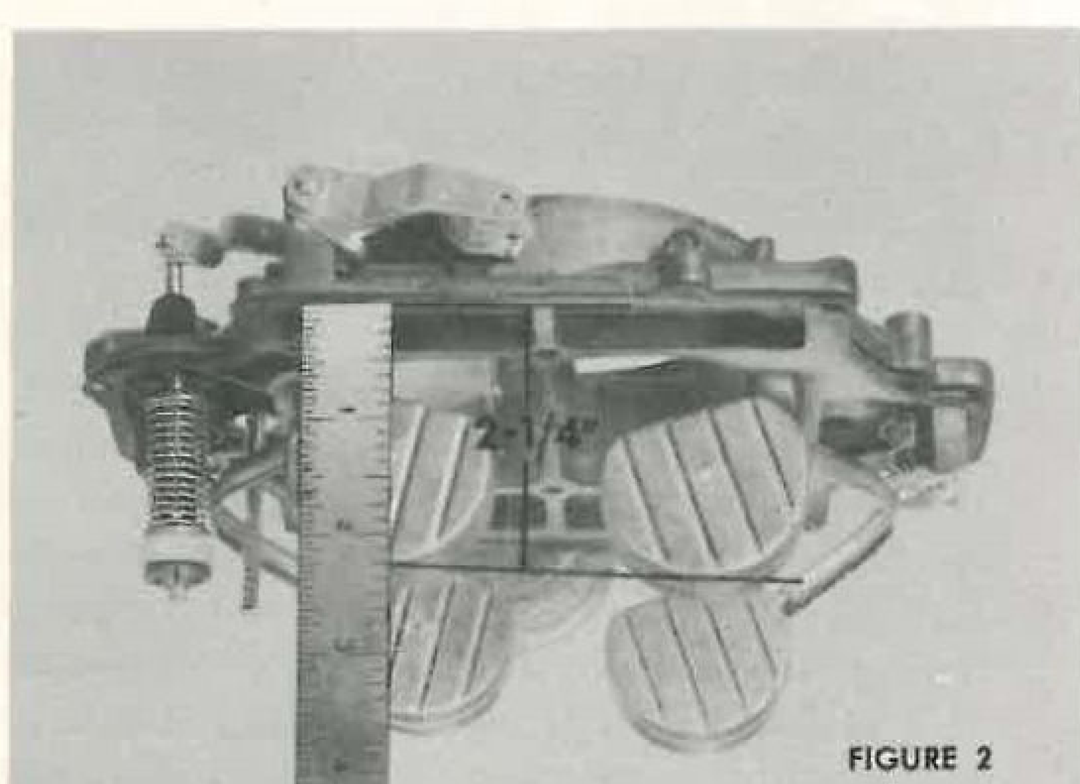


FIGURE 2

c. Float Drop: With the air horn supported in an upright position, the distance from the air horn gasket to the bottom of the floats should be $2\frac{1}{4}$", Fig. 2. Adjust as necessary by removing float and bending the small tang which contacts the float needle seat, "D" Fig. 1. Bend tang toward needle seat to lessen drop, or away from seat to increase drop.

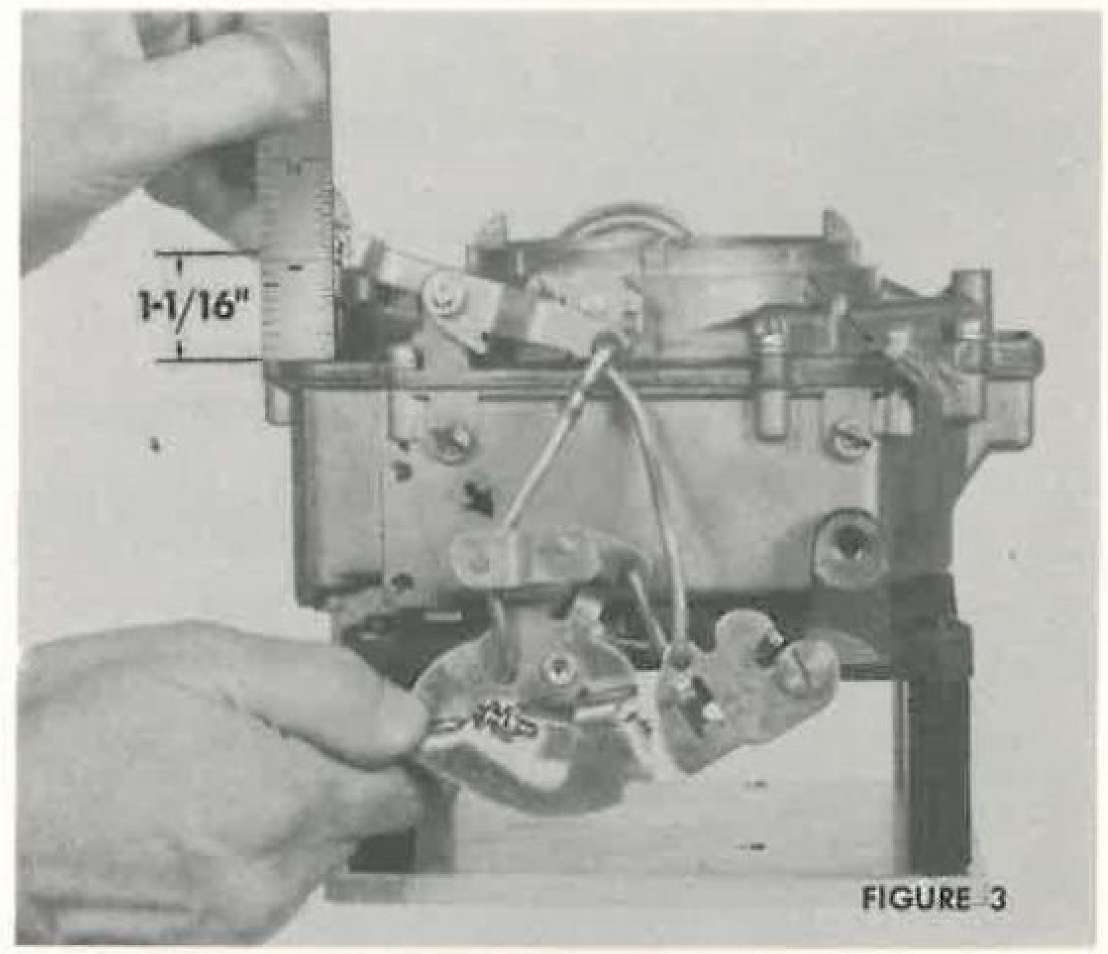


FIGURE 3

2. Pump Rod Adjustment: Back out both the throttle stop screw and the fast idle adjusting screw so that the throttle valves are tightly closed. With the throttle lever held in this position, carefully bend the pump rod until the dimension from the top of the air horn surface to the bottom edge of the pump plunger rod is $1\frac{1}{16}$", as shown in Fig. 3.

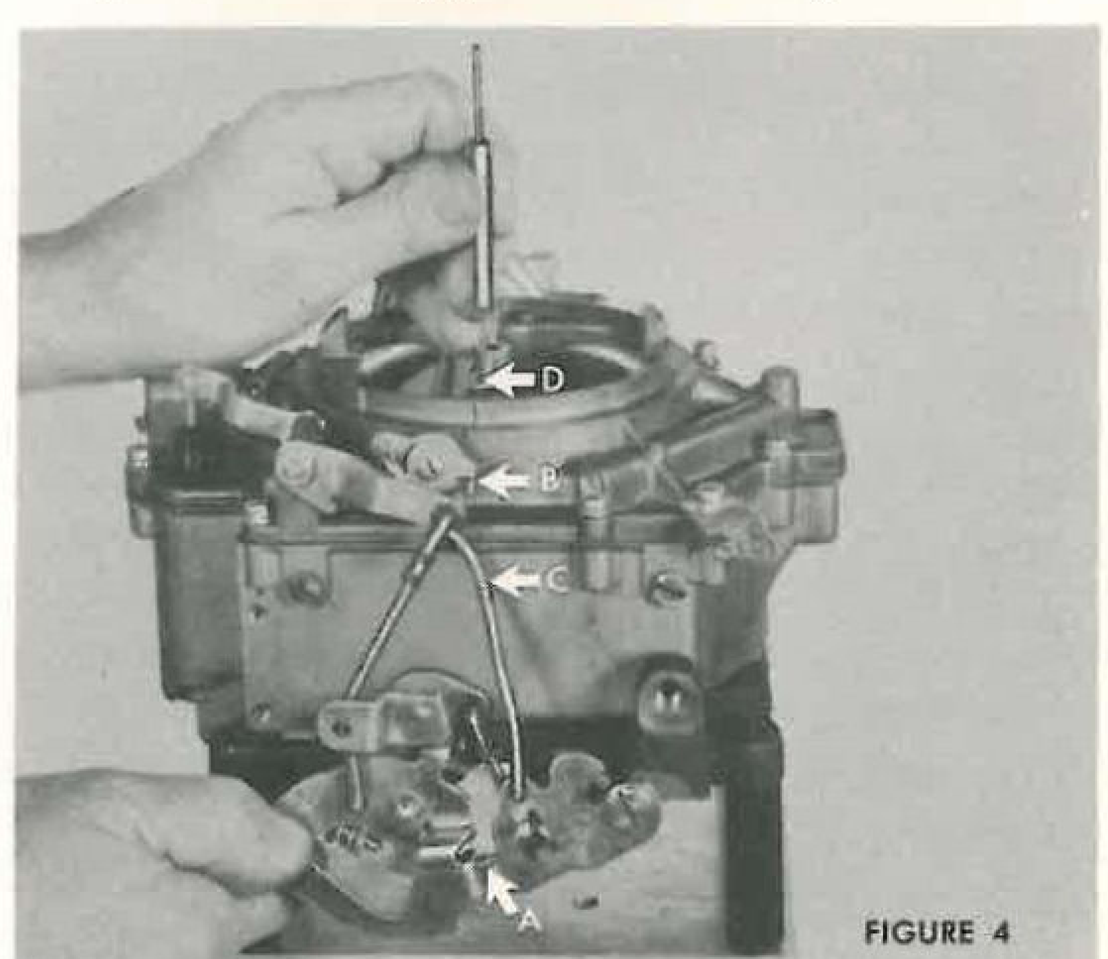


FIGURE 4

3. Choke Rod Adjustment: With the choke thermostat cover set at index mark, adjust and locate the fast idle screw against the second step on the fast idle cam "A" Fig. 4, the side of the screw being against the side of the highest step. Be sure that the choke trip lever is in contact with the choke counterweight lever "B." With the fast idle screw and fast idle cam in this position, carefully bend the choke rod "C" to obtain a clearance of .053 (Gauge J-6056) between the top edge of the choke valve and the dividing wall of the carburetor air horn "D" Fig. 4.

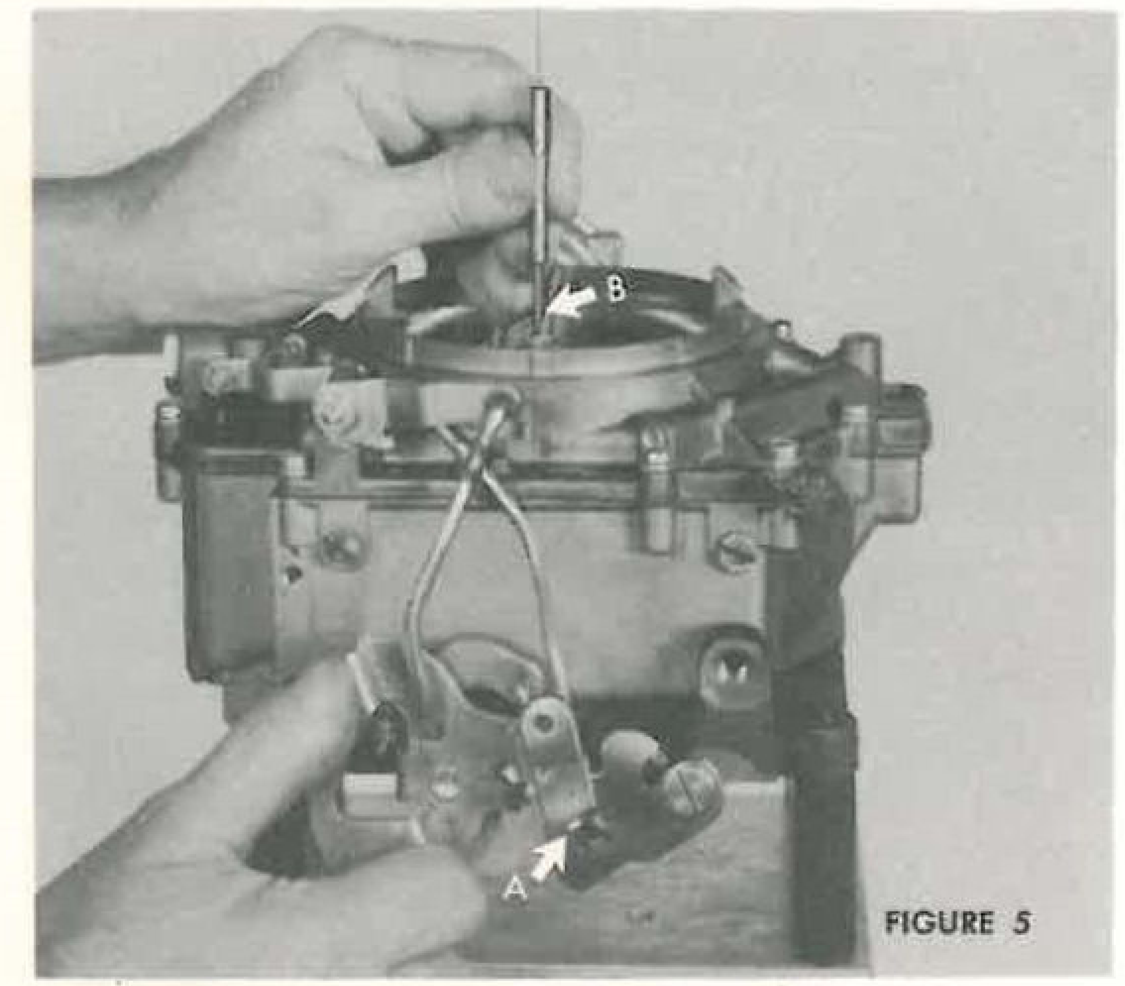


FIGURE 5

4. Unloader Adjustment: With the choke thermostat cover set at index, and trip lever in contact with choke counterweight lever "B" Fig. 4, move the throttle lever to full wide open position. Hold the throttle lever in this position and carefully bend the tang "A" Fig. 5, on fast idle cam to obtain a clearance of .115" (Gauge J-6057) between the top edge of the choke valve and the dividing wall of the carburetor air horn "B" Fig. 5.

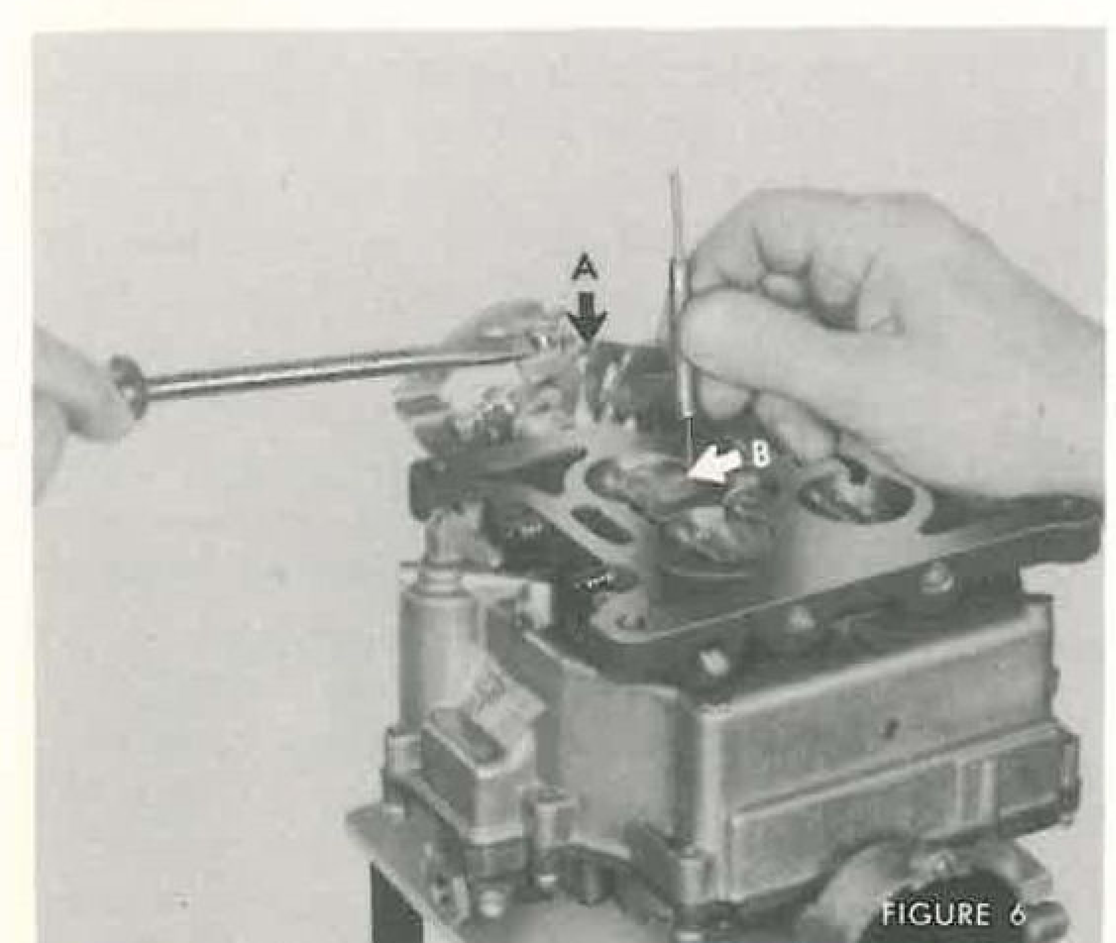


FIGURE 6

5. Fast Idle Adjustment: With the choke thermostat cover set at index, move the fast idle cam so that the choke valve is fully closed. Hold the throttle lever in the closed position so that the fast idle adjusting screw rests on the highest step of the fast idle cam "A" Fig. 6. Adjust the fast idle screw to obtain a clearance of .024" (Gauge J-6057) between the throttle valves and the primary bores of the throttle body on the side opposite the idle adjusting needles "B" Fig. 6.
NOTE: If making this adjustment with the carburetor mounted on the engine, have the engine and transmission hot. With the fast idle screw resting on the high step of the fast idle cam, adjust the screw to give an engine speed of 1500 RPM in neutral with the air cleaner in place.

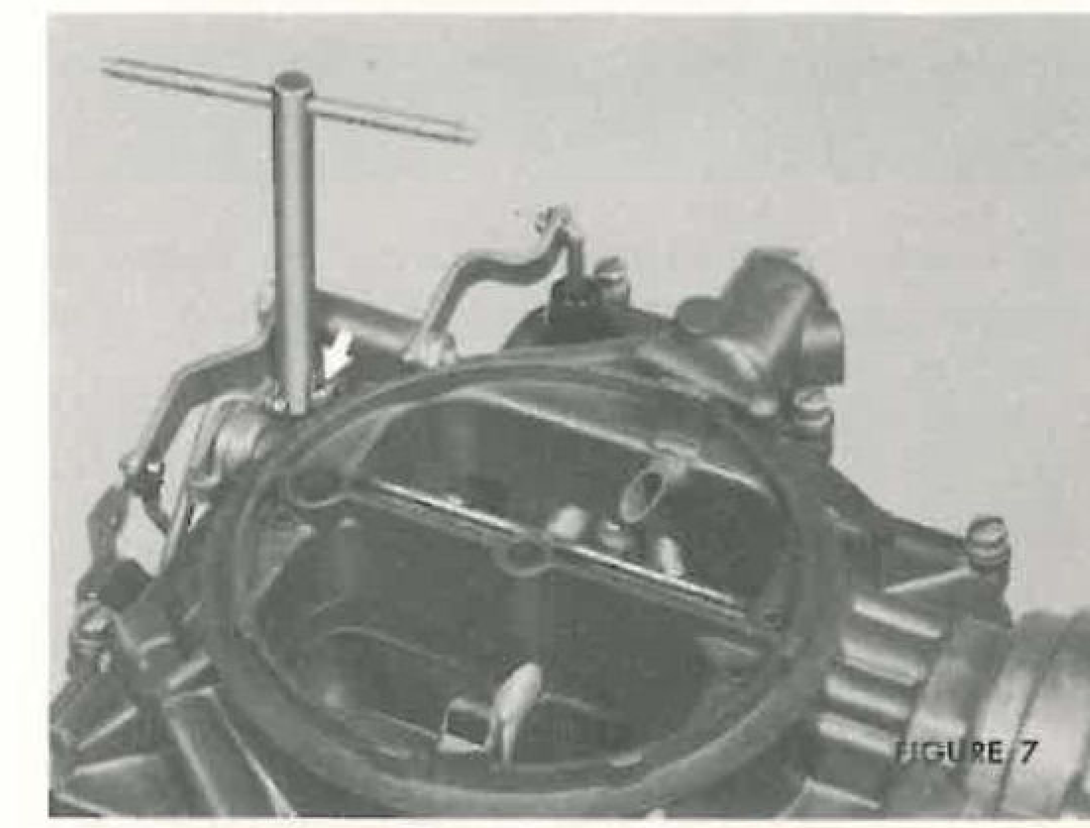


FIGURE 7

6. Atmospheric Idle Vent Adjustment: Insert a .040" gauge (Gauge J-6061) between the throttle valves and the primary bores of the throttle body on the sides opposite the idle adjusting needles. With the throttle valves closed against this wire gauge bend the atmospheric vent contact arm, using Tool J-5197, until it holds the atmospheric vent valve in the carburetor air horn open approximately $\frac{1}{64}$". "See arrow" Fig. 7. This adjustment assures proper vent opening at various throttle positions.
7. Secondary Throttle Lock-Out Adjustment: With the choke valve partially closed and the fast idle cam and secondary lockout lever in position as shown in Fig. 8, there should be a clearance of .015" between the tang on the lever and the cam. Using tool J-4552, bend the tang of the lever horizontally to obtain this .015" clearance.
8. Secondary Throttle Contour Adjustment: With the choke valve wide open and the fast idle cam and secondary lock-out lever in position as shown in Fig. 9, there should be a clearance of .035" between the tang on the lever and the cam. Using tool J-6058, bend the lever tang to obtain this .035" clearance.

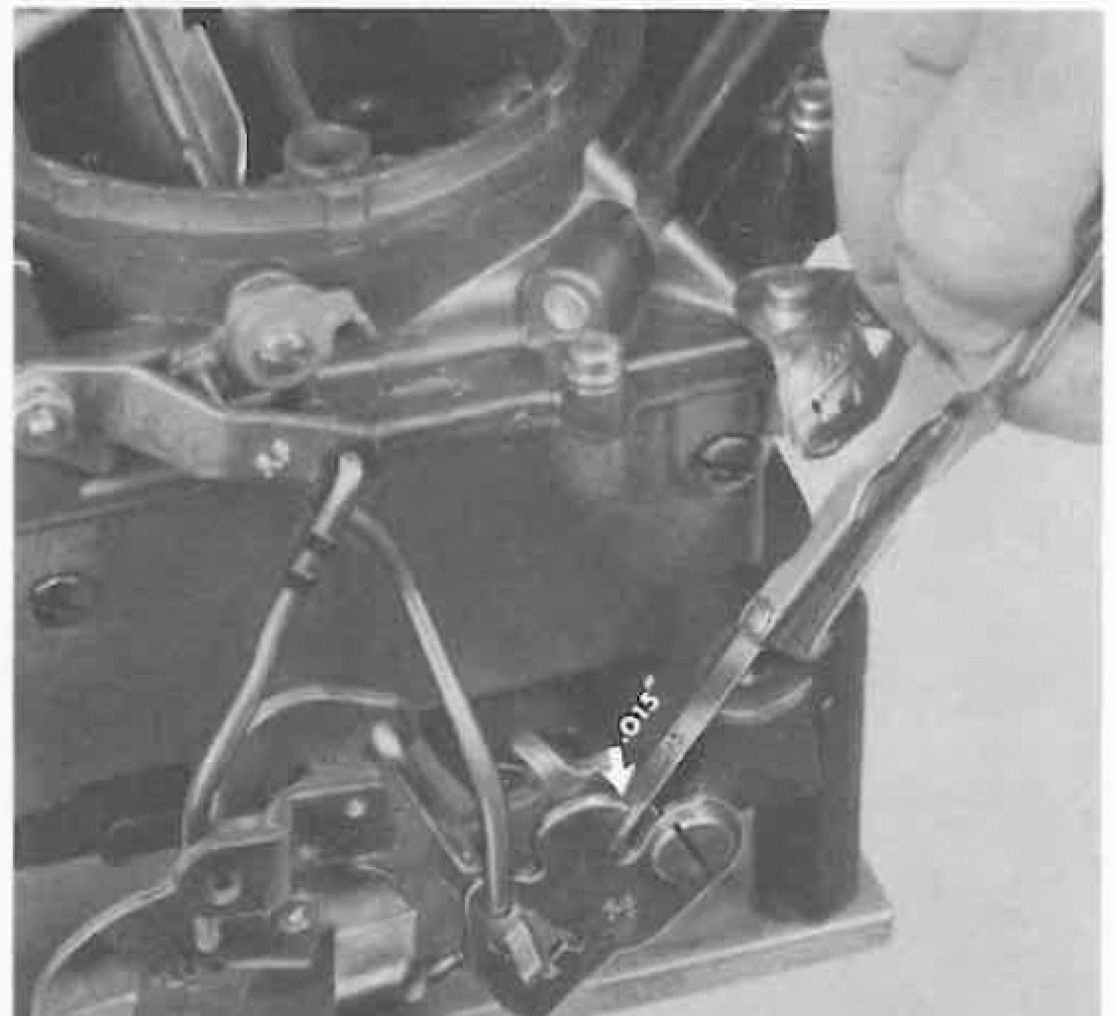


FIGURE 8

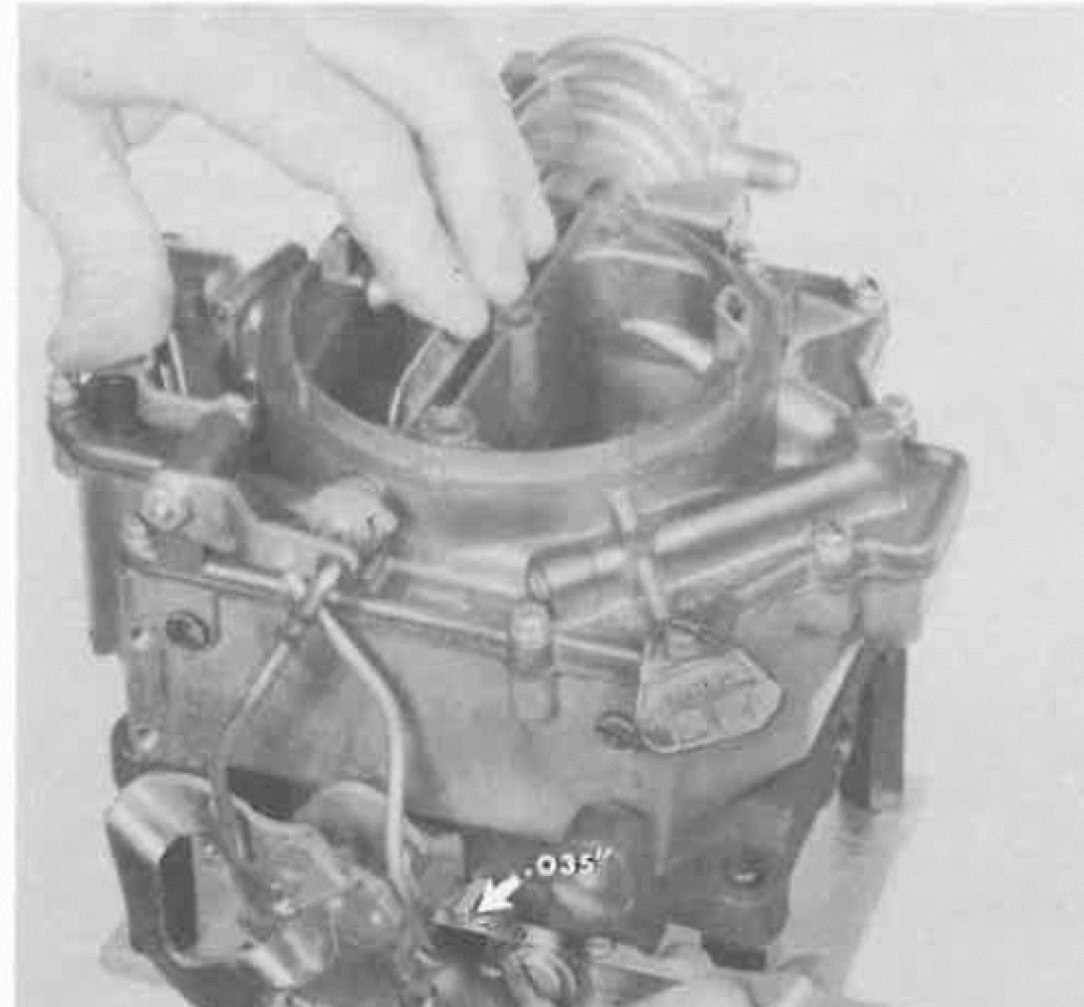


FIGURE 9

The essential tools required to service the Rochester Carburetor are listed under Tool Kit No. J-6060. The kit contains the following tools:

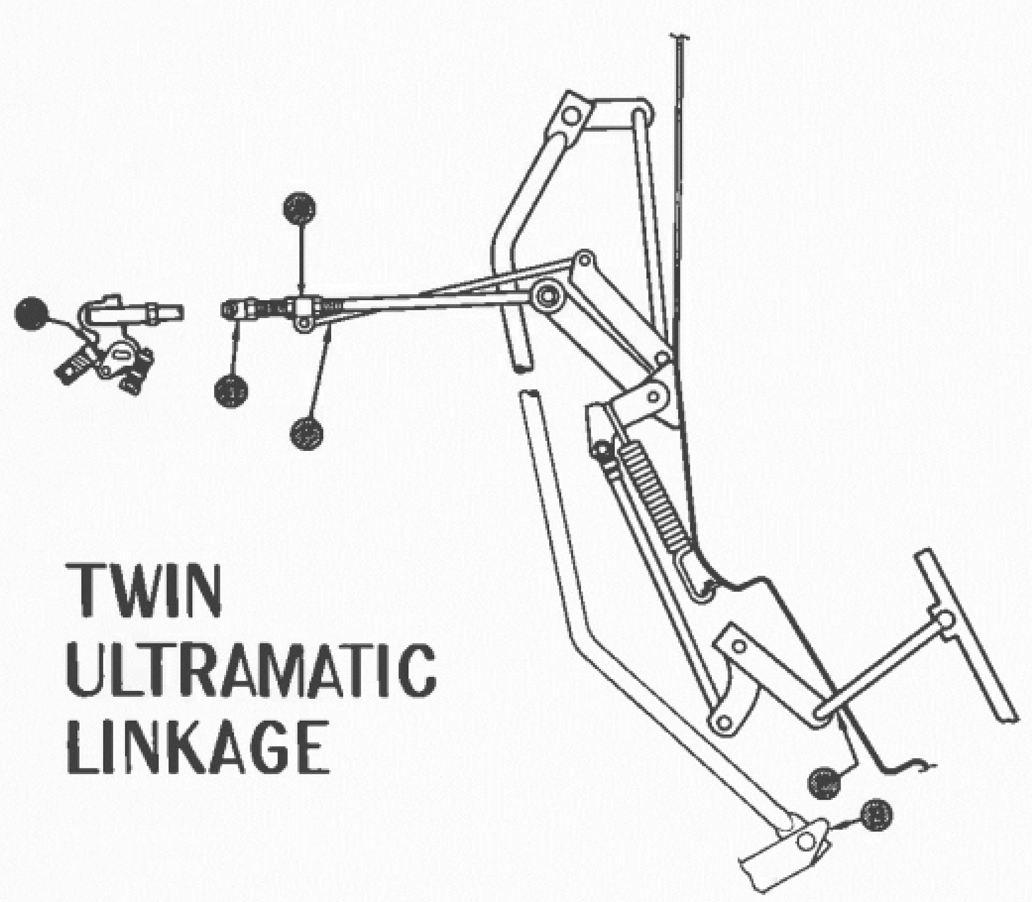
J-5399 Float Level Gauge
J-6056 Choke Adjustment Gauge .053"
J-6057 Unloader Gauge .115",
Fast Idle Gauge .024"
J-6061 Atmospheric Vent Gauge .040"
J-5197 Bending Tool
J-4552 Bending Tool
J-6058 Bending Tool

The carburetor stand shown in the illustrations is available under Tool No. J-5923.

Tool orders should be direct to Kent-Moore Organization, Inc., 3044 W. Grand Blvd., Detroit 2, Michigan.

PROCEDURE FOR ADJUSTING LINKAGE ON 1955 V-8 CARS WITH AUTOMATIC TRANSMISSIONS

The following is a step-by-step procedure for adjusting the carburetor throttle linkage on the 55th Series automobiles.



Step #1 Warm up the engine to operating temperature. This should result in the choke being wide open and the carburetor being in the *OFF* fast idle position. Set the idle of the carburetor at 400 RPM in Drive position.

Step #2 Loosen the two lock nuts about 4 or 5 turns that position the carburetor transmission cross shaft adjuster "A" and make sure that the adjuster is free to move back and forth.

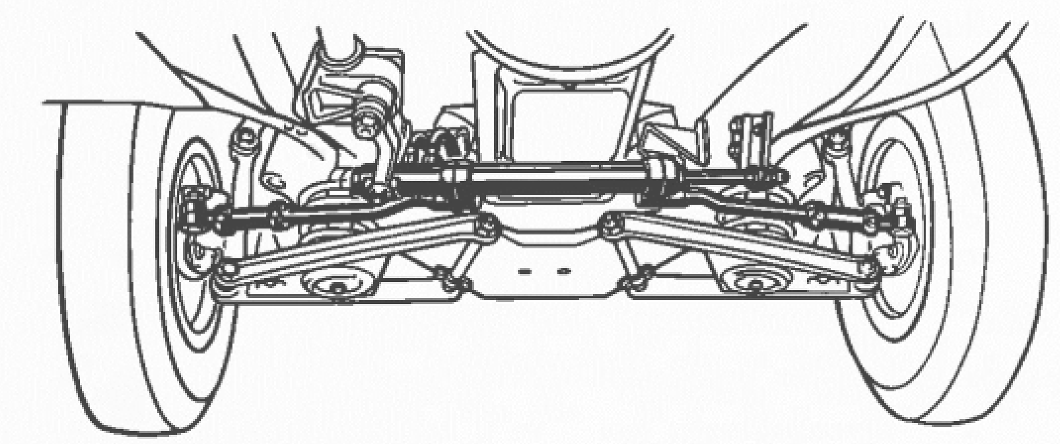
Step #3 Make sure that the transmission throttle shaft outer lever at the right rear side of the transmission "B" is in its proper rearward position in relation to the transmission case. If it is out of adjustment correct by following the procedure outlined in the G.S. Transmission Training Booklet.

Step #4 With the carburetor idle adjusting screw at its stop "C" at the carburetor, adjust the carburetor throttle operating turnbuckle "D" so that the accelerator pedal rod lever just touches the underside of the floorboard "E." Re-adjust the turnbuckle "D" by turning it out one full turn which will then prevent the accelerator pedal rod lever from touching the underside of the floorboard at "E." Secure the nut at the turnbuckle "D."

Step #5 Apply a slight rearward pressure on the carburetor transmission cross shaft "F" and move up the rear lock nut to the adjuster "A," move up the front lock nut on the adjuster and tighten. Make sure that the alignment of the adjuster is such that it does not cause the lever to bind.

POWER STEERING

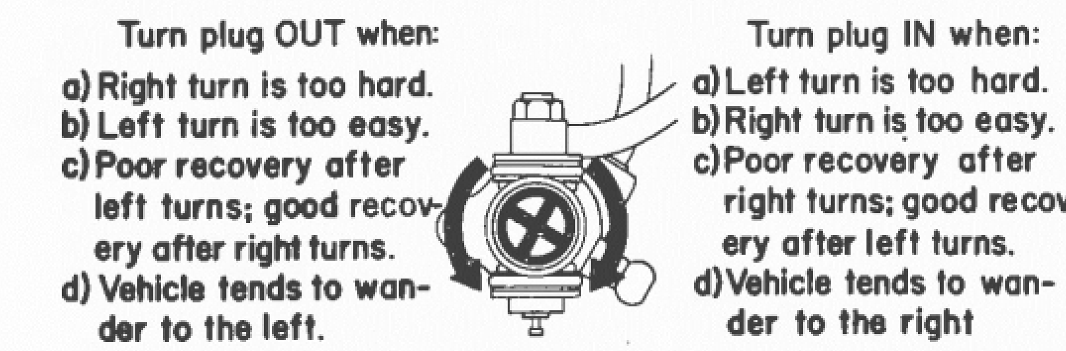
Monroe Power Steering is available as optional equipment on the 5540 chassis. Bendix Power Steering is available on the 5560 and 5580 chassis. The Bendix unit is covered in your Serviceman's Training Book and the Service Manual, except as noted.



Monroe Power Steering

Very shortly we will have available for the field complete servicing procedure for the Monroe Power Steering. In the meanwhile, we are supplying the method of adjustment of this unit.

There is only one adjustment and that is located on the valve end of the left side of the cylinder assembly. This adjustment is a screw type of plug with a milled "X" in its face. By turning this plug a variation in adjustment is made.



Procedure for adjustment of a maladjusted power cylinder valve

1. Scribe a mark on the plug and on the end of the valve body to indicate the original position of the plug.
2. Remove the cotter pin and turn the plug 1/6 of a turn in the proper direction (see adjustment). Replace the cotter pin.
3. Road test the vehicle.
4. If steering action is still not correct, turn plug an additional 1/6 turn and road test again. Use procedure shown on the drawing.
5. Continue the adjustment until the steering action is correct and install cotter pin to lock plug. If the steering action is still not correct after the plug has been moved 1/2 of a full turn in the proper direction it will then be necessary to remove the unit from the car.

TROUBLE SHOOTING

Hard steering in one direction only

Possible Cause

1. Tire pressure uneven.
2. Improper front end alignment.
3. Steering gear and linkage not lubricated.
4. Bind in steering column, gear box or linkage.
5. Maladjusted power cylinder valve.
6. Bind in piston rod.
7. Power cylinder valve sticking.

Hard steering in both directions

Possible Cause

1. Low fluid level.
2. Tire pressure low.
3. Improper front end alignment.
4. Steering gear and linkage not lubricated.
5. Bind in steering column, gear box or linkage.
6. Maladjusted power cylinder valve.
7. Bind in piston rod.

8. Bind in pitman arm or drag link stud.
9. Pump belt slipping or broken.
10. Low pump pressure.
11. Loss of pressure in power cylinder.
    a. Internal leakage past piston.
    b. Internal leakage past valve (other than "O" ring leakage).
12. Insufficient fluid flow.
    a. Pump flow restrictor plugged.
    b. Hoses plugged or restricted.
    c. Restricted valve parts or other internal passages.
13. Power cylinder valve sticking.

Poor recovery on turns

Possible Cause

1. Tire pressure low.
2. Improper front end alignment.
3. Steering gear and linkage not lubricated.
4. Bind in steering column, gear box or linkage.
5. Maladjusted power cylinder valve.
6. Bind in piston rod.
7. Bind in pitman arm or drag link stud.
8. Power cylinder valve sticking.

Self Steering

Possible Cause

1. Tire pressure uneven.
2. Maladjusted cylinder valve.
3. Bind in pitman arm or drag link stud.
4. Power cylinder valve sticking.

Noise

Possible Cause

1. Low fluid level.
2. Pump belt tension incorrect.
3. Misaligned pump and crankshaft pulleys.
4. Restricted air vent in pump reservoir cover.
5. Pump pulley retaining bolt loose.
6. Loose or worn pump pulley key.
7. Pump shaft bearing worn.
8. Worn bushings in pump body and/or cover.
9. Dirt and sludge in system.
10. Loose pitman arm or drag link stud.
11. Linkage interference or loose linkage.
12. Noise in power cylinder.
13. Hoses rubbing against chassis or body metal.

Hydraulic fluid leaks

Possible Cause

1. At hose fittings.
2. At pump.
3. Around piston rod on power cylinder.
4. At valve end of power cylinder.
5. Leaking hose.

Oil Specifications

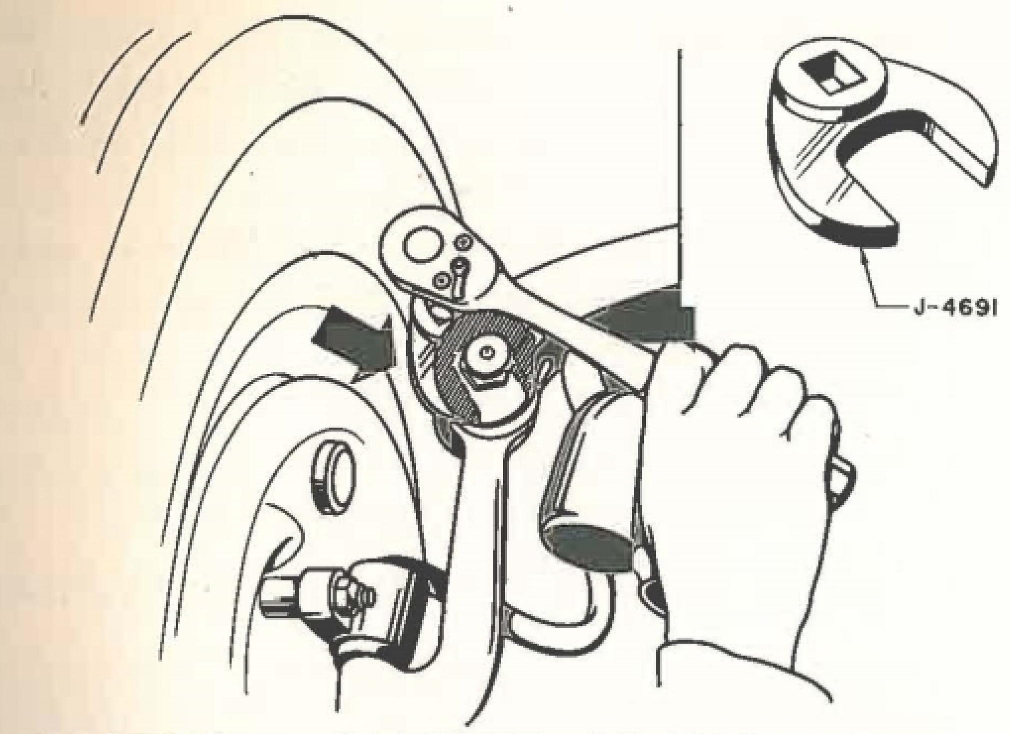
Type of fluid	Type "A" Automatic Transmission Fluid.
Bendix Change:	The piston in the Bendix power cylinder unit cannot be serviced as the unit is now sealed.

BRAKES

On the 5580 and 5560 a new brake master cylinder and new location is used with a new three terminal stop-light switch. The third terminal in the switch is used in conjunction with the new load compensator in the new suspension. All new permanent wheel brake shoe anchors are used. A few internal changes have been made in the Power Brake Assembly that permits retention of vacuum over a longer period of time. This change incorporates two poppet valves in the vacuum piston, one for the vacuum and one for atmosphere. An article will appear shortly in the Service Counselor giving the servicing procedure for these two poppet valves.

CASTER AND CAMBER ADJUSTMENTS

Caster: Neg. 1° plus—minus $\frac{1}{2}$°   Camber: 0° plus $\frac{3}{4}$° minus $\frac{1}{4}$°   Toe In: 0 to + $\frac{1}{16}$"



CASTER & CAMBER ADJUSTMENT

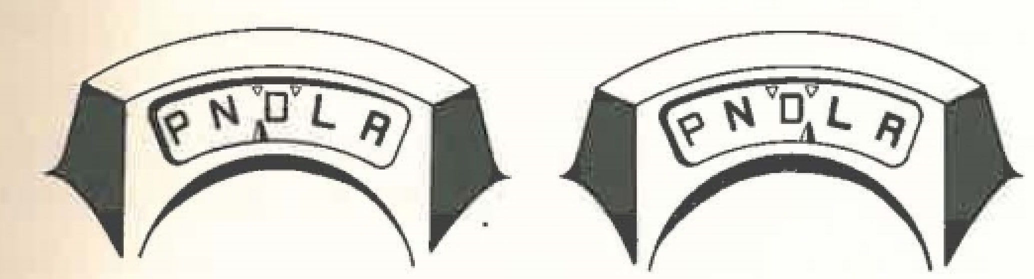
Caster Adjustment

Loosen the clamp bolt in the upper end of the steering knuckle support. Turn the *eccentric bushing* with tool number J-4691. Turn the bushing in multiples of one full turn to maintain the same camber setting. Always set the caster equal on both sides.

Camber Adjustment

Loosen the clamp bolt at the upper end of the steering knuckle support. Rotate the *eccentric bushing* using tool No. J-4691 to give a correct setting for each front wheel. Do not rotate the bushing more than $\frac{1}{2}$ turn as this will give maximum camber adjustment at the eccentric. Any additional turning will affect caster adjustment. Be sure bushing is correctly located in relation to clamp bolt. Tighten the clamp bolt and recheck.

THE TWIN ULTRAMATIC TRANSMISSION INDICATOR



TWIN ULTRAMATIC TRANSMISSION SELECTOR INDICATOR

The Twin Ultramatic Transmission Position Indicator is built into the instrument panel just above the steering column. The P, N, L, and R symbols on the indicator remain the same as the 54 Series G. S. Transmissions. A change has been made in the Dot and Drive positions symbols.

On the new position indicator there is a triangular mark on each side of the D. The one on the left is the same as the dot on the 54th Series G.S. transmission or the H position on the previous Ultramatic Transmissions. The mark on the right of the D is the drive position which is equivalent to the D position on the 54th Series G.S. Transmissions.

Twin Ultramatic Transmission

The Twin Ultramatic Transmission is standard equipment on Model 5580 and is optional on the 5540 and 5560 models. The unit is serviced the same as covered in your Serviceman's Booklet and recent Service School.

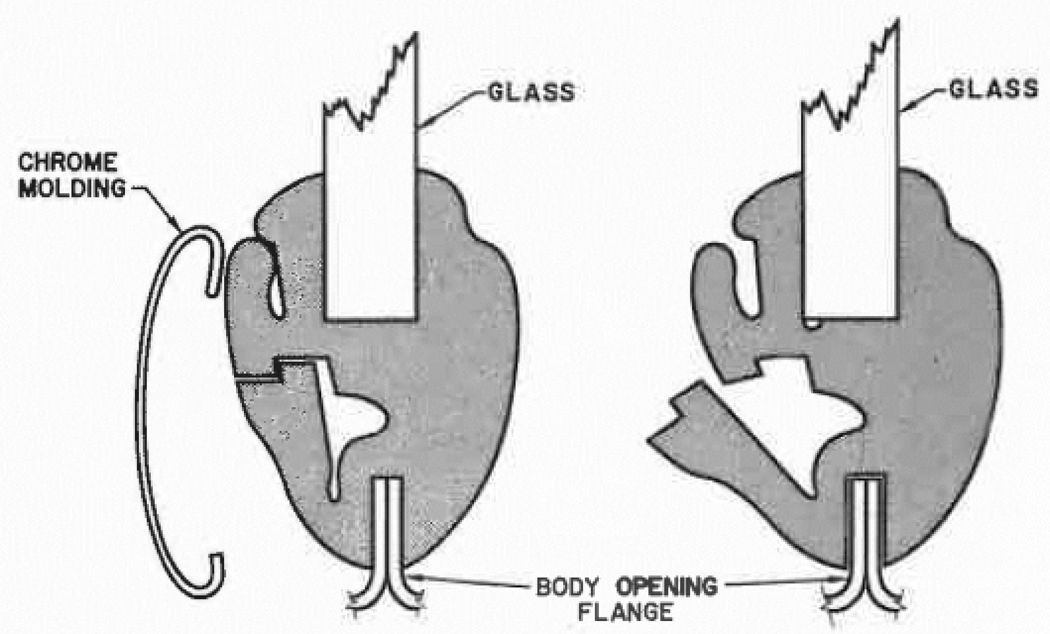
A number of improvements have been made in the 55th Series Valve Body a modulating valve has been added in the valve body, this valve changes the high range clutch pressure when torque requirements are greatest, such as starting in the high range 'Drive' position. The torque converter has been improved and its torque multiplication has been increased to 2.9 to 1 by the change in design of the converter pump. Twelve plates are now used in the High Range Clutch.

For better alignment of the transmission to the engine, a dowel has been placed in the top of the flywheel housing that mates with a dowel hole in the bell housing.

Standard transmission and overdrive equipment will be available for 5540 and 5560 models.

WINDSHIELD REPLACEMENT

Replacing the windshield glass in the 55th Series cars is similar in many respects to replacing the windshield glass in the 54th and 26th Series cars as described in Service Counselor Vol. 27, No. 5, May, 1953.



WINDSHIELD WEATHER STRIP

However, for your information we are listing the items that are different.

1. Remove the two upper outside finishing moulding joint cover retaining nuts and plates and remove the joint covers. Clean out the sealer between the roof panel and the windshield upper chrome moulding. Bump the moulding upward slightly and carefully remove the moulding.
2. Remove the sheet metal screws from the windshield posts that hold the end mouldings in place, carefully remove the end mouldings. Loosen the wiper drivers and carefully remove the windshield lower moulding.
3. Using a putty knife or suitable tool unlock the forward side of the weatherstrip completely around the weatherstrip. See illustrations of locked and unlocked weatherstrip.
4. When installing the windshield, apply a soap and water solution or lubricate the weatherstrip slots and use the sash-cords as described in the Service Counselor Article.
5. A tool for locking the weatherstrip can be made from a piece of wood fibre by grinding down one end to a thin smooth edge. Press inward on the step of the lower portion of the lock with the tool forcing it to lock under the step of the upper portion. Work the tool progressively along the lower step until the weatherstrip is completely locked.
6. Apply a thin coat of Dolphinite Sealer on the rear edge of the windshield posts to seal the end mouldings. Fill in the groove between the roof and upper windshield moulding with Dolphinite Sealer.

Rear Window Replacement

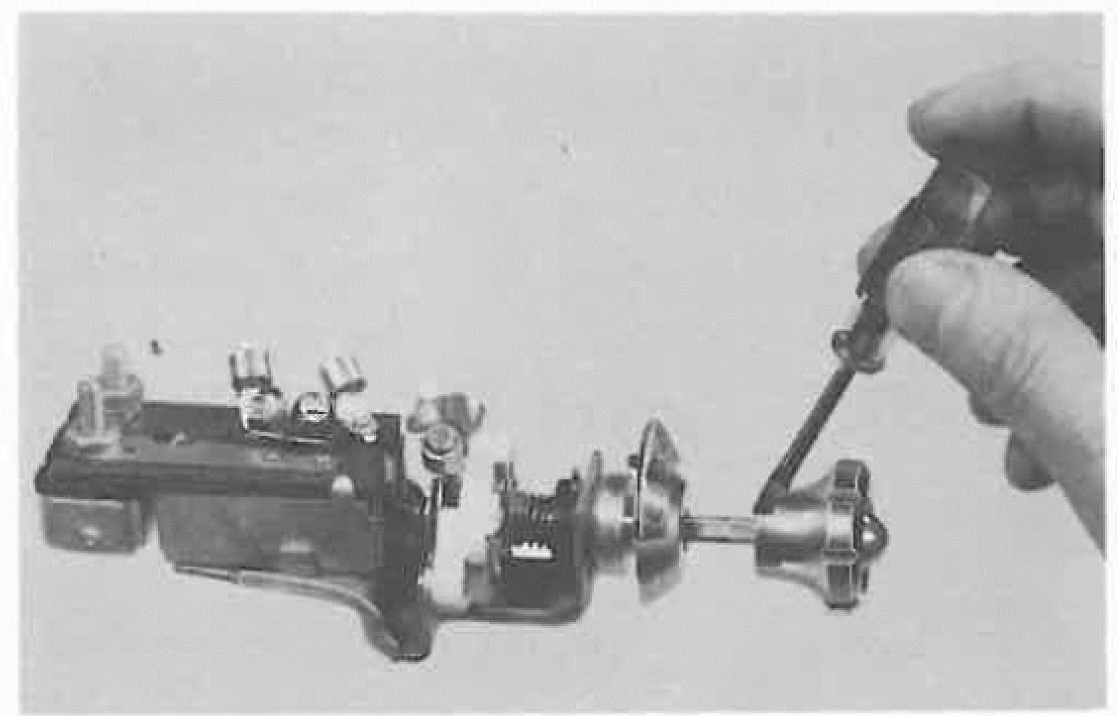
Replacing the rear window glass in the 55th Series cars is the same as in the 54th and 26th Series, utilizing the same type round rubber wedges to lock the weatherstrip in place. Use the instructions described in Service Counselor Vol. 27, No. 6, June, 1953.

Windshield Wipers

A power-boosted Super Speed Wiper system with Cam-o-matic wiper arms is now standard with the new type windshield. The system provides better vision at higher speeds through its dual controls.

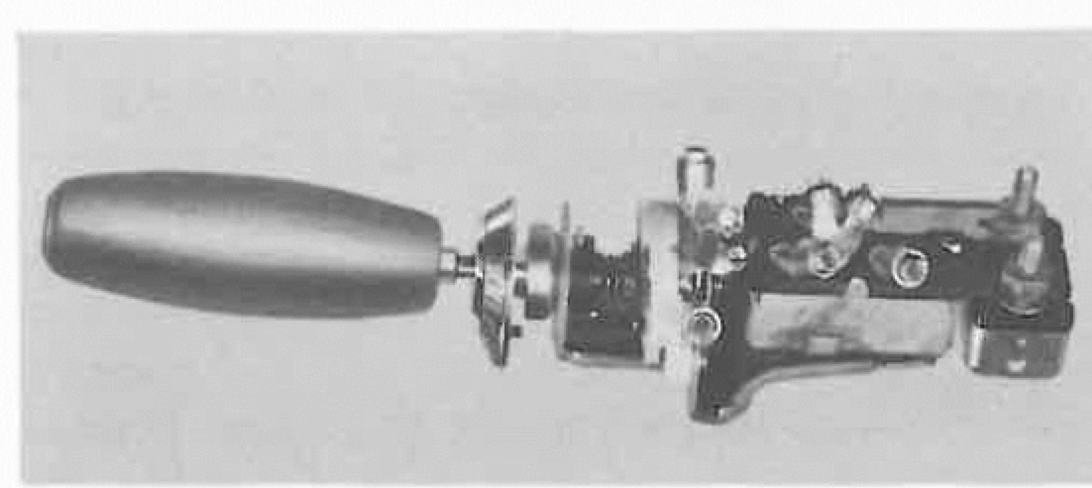
A main control knob is employed to provide control of the speed and also to provide for the remote control feature for changing of the wiper range. Below the knob is a unitized lever which, when rotated approximately 30 degrees, provides either a long or short stroke.

Removal of Control Knobs on Dash Panel



The removal of the knobs for the controls on the instrument panel can be accomplished easily with the aid of a small screwdriver. Insert the small screwdriver into the notch located on the back edge of the knob and press inward toward the shaft. At the same time pull off the knob. The pressure of the screwdriver against the spring releases the spring from a slot in the shaft.

Removal of the Headlight Switch

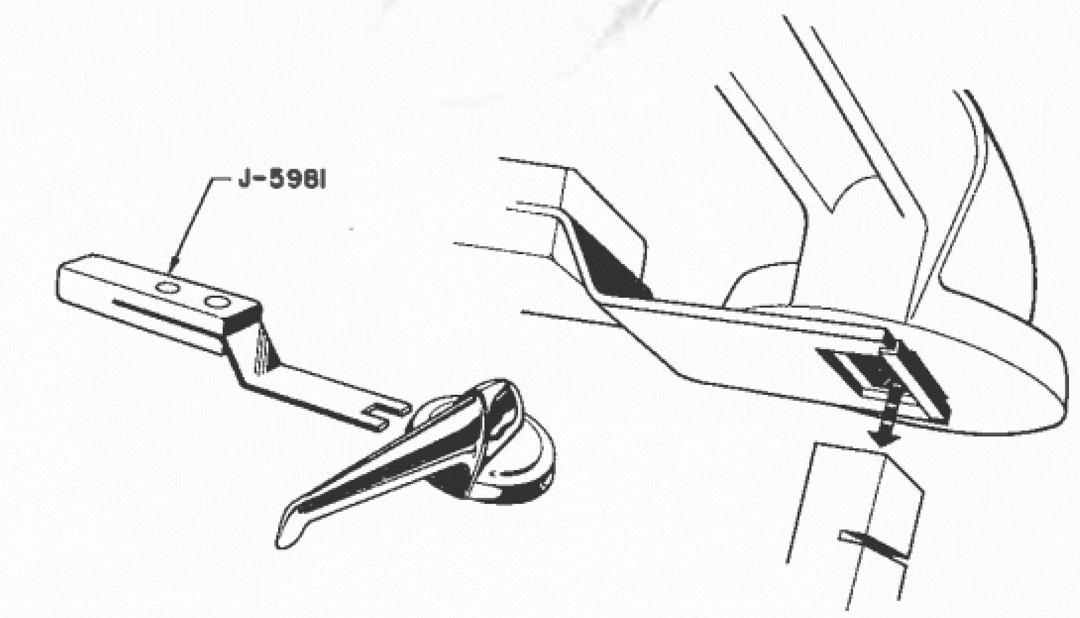


A special tool (tool No. J-5986) is necessary to remove the headlight switch from the dash panel.

First remove the control knob, insert the special wrench over the light-switch shaft, the hex of the tool will fit into a concealed nut in the bezel which holds the switch in place. By turning the wrench counterclockwise the bezel can be removed. After the light wires have been removed the switch can be taken out.

Removal of Inner Door Handles

A new method of retaining the inner door handles to the doors is used on all models. A special tool (No. J-5981) makes removal very simple, by inserting the prongs of the tool behind the handle at a position 90° to the handle and pressing in, will depress the retaining spring permitting removal (see picture).



INSIDE DOOR HANDLE REMOVAL

TUBELESS TIRES

The 55th Series cars are equipped with improved tubeless tires.

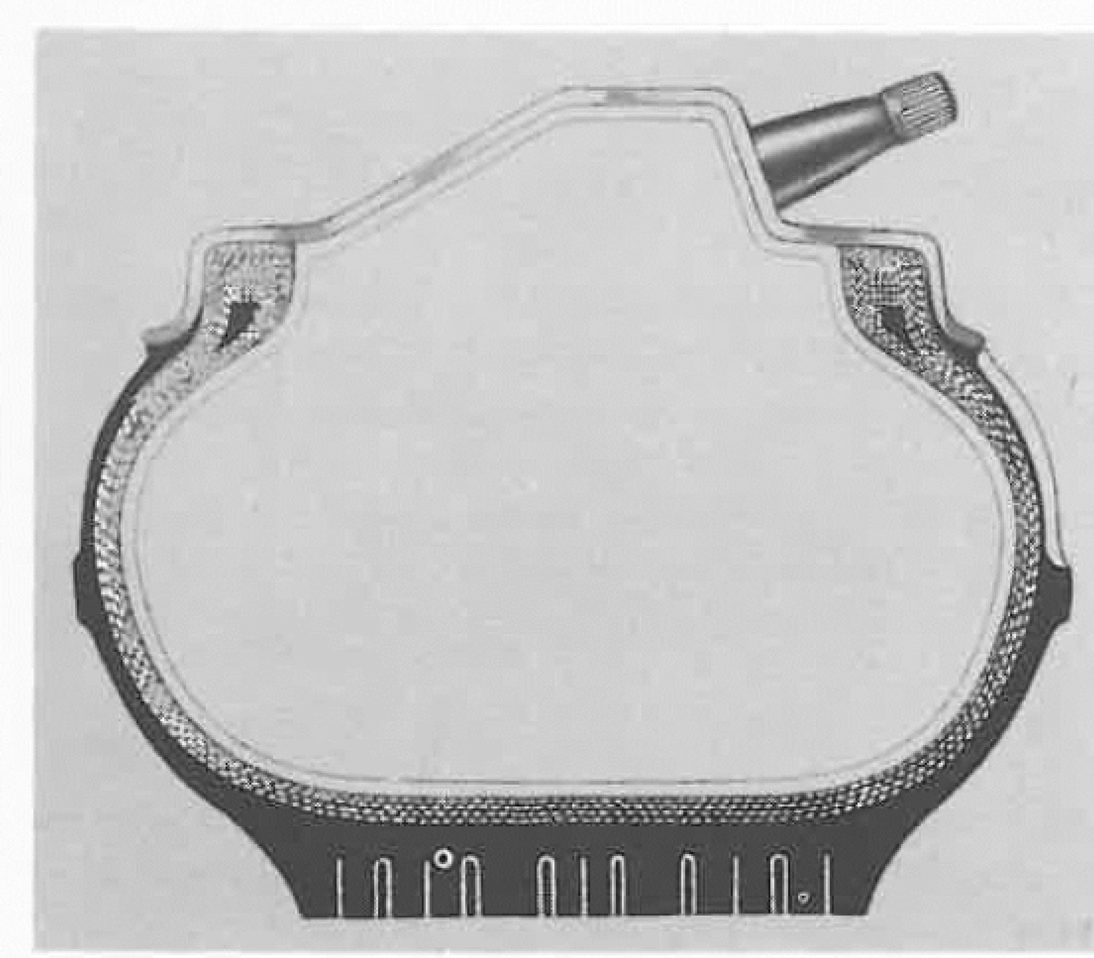
Squeal, as well as whine, is reduced by engineering changes in the grooves and tread segments.

Riding qualities are greatly improved through the process of handling the tread elements along with more resilient tread stock for better cushioning.

Improved traction, edges of the tread segments are angled for improved forward and lateral traction.

The tire and tube assembly and tubeless tire story may be compared by illustrations.

Tire and Tube Assembly

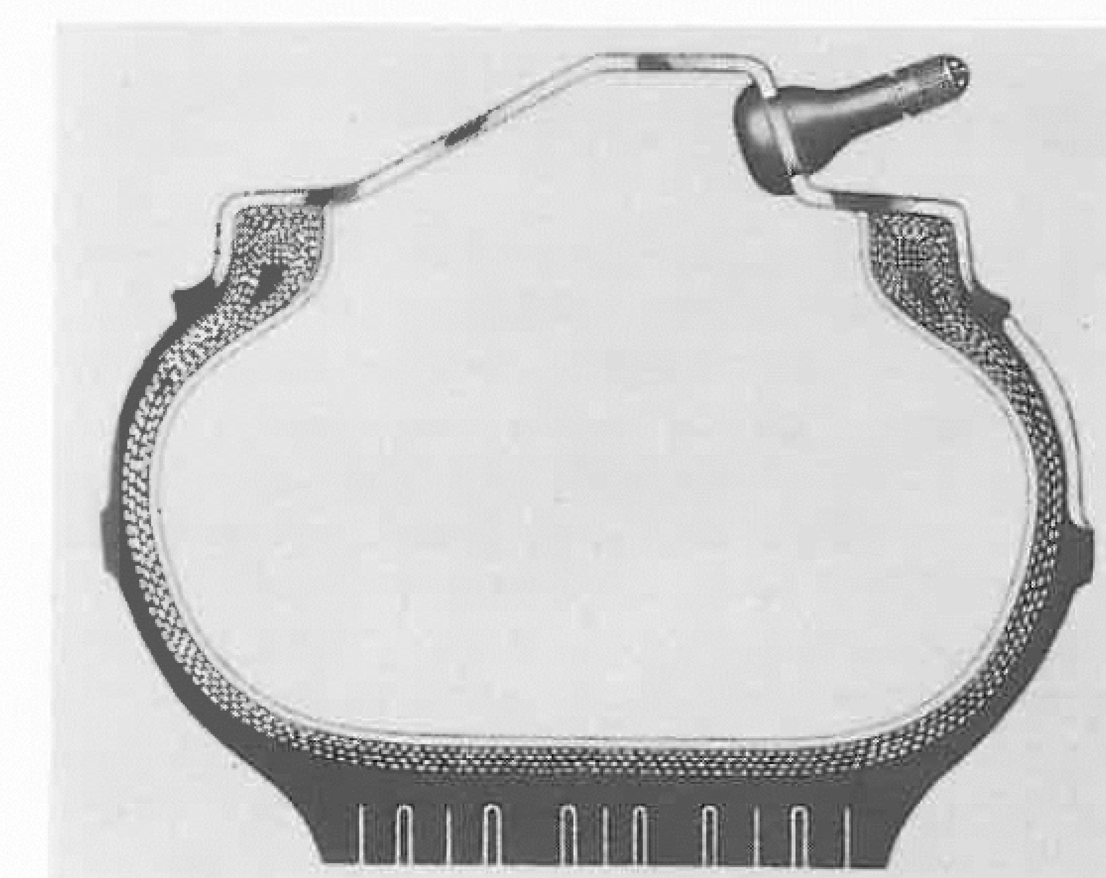


Two units to balance the tire and tube assembly.

The tube stretched into position can tear or explode.

Tube may cause trouble through pinching, chafing, buckling, shifting or valve shearing.

Tubeless Tire

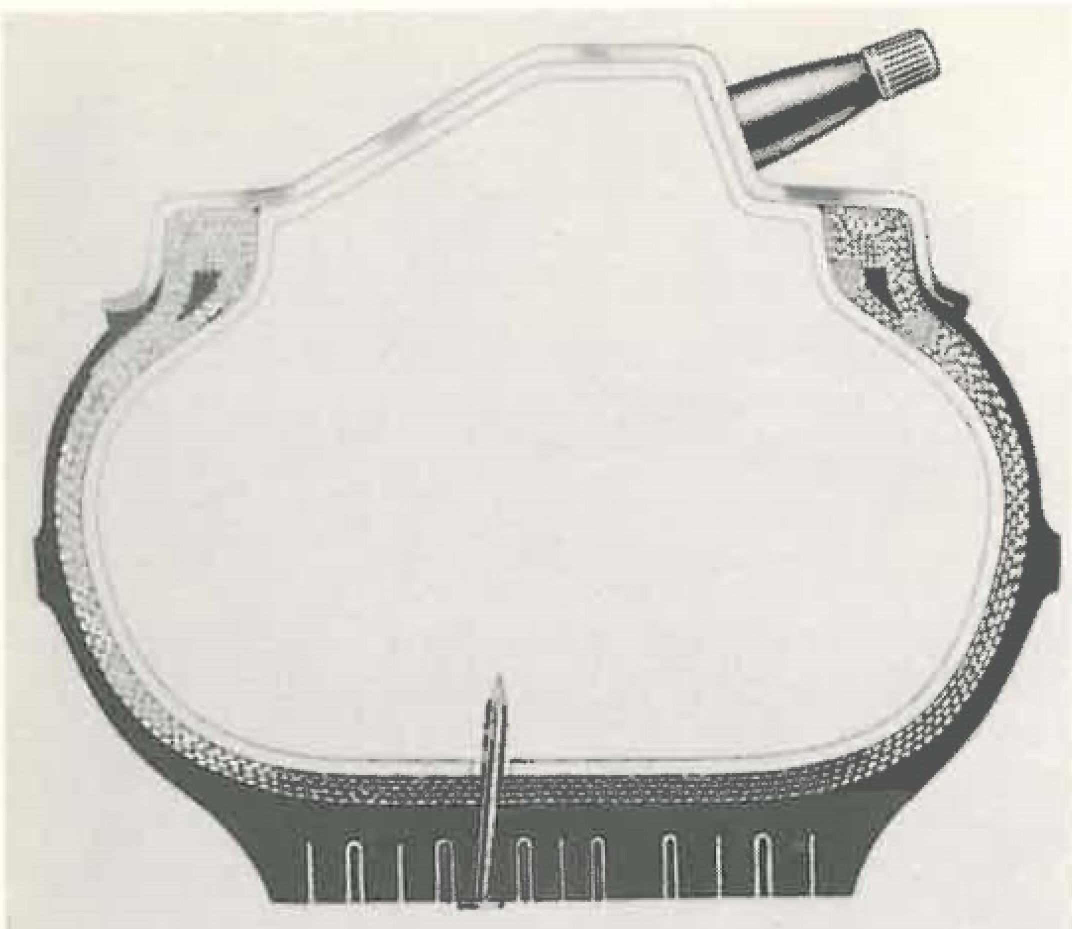


One unit to balance, the liner is integral part of the tire.

Liner welded into position, same size as the rest of the tire.

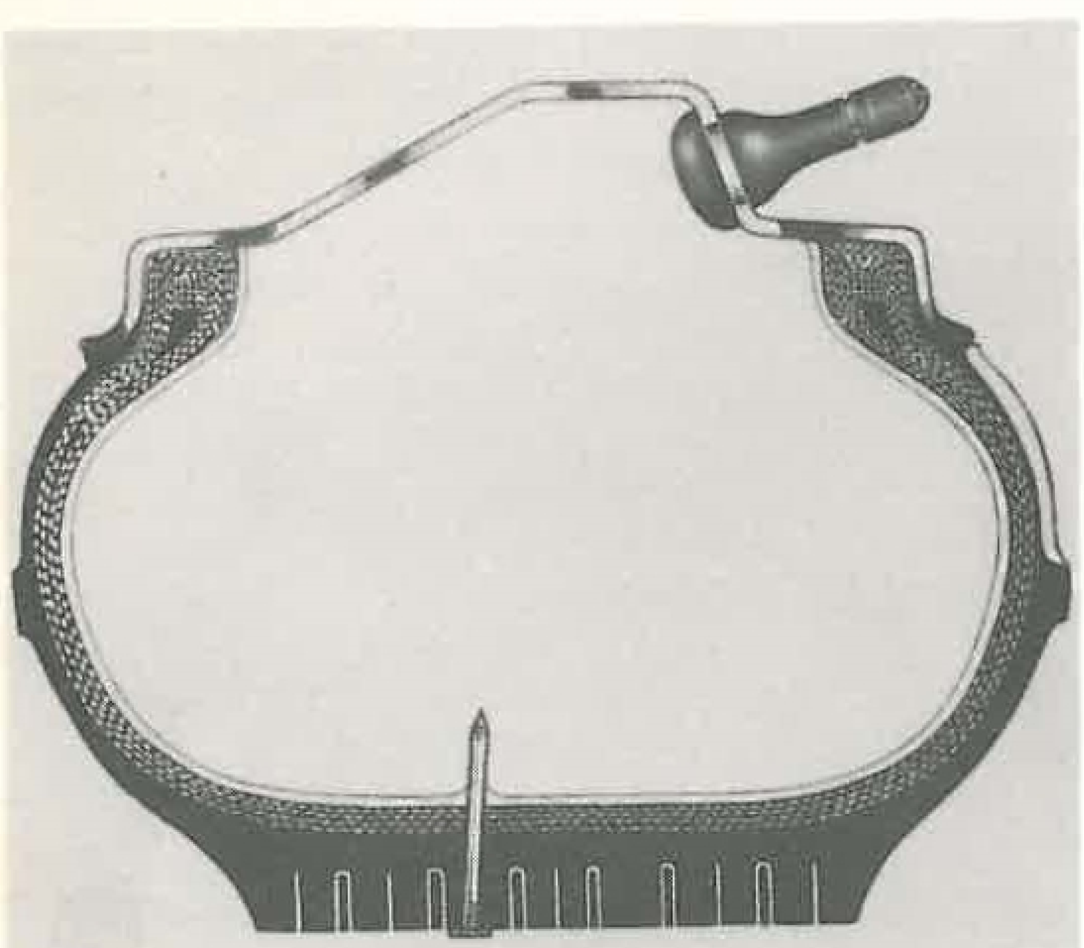
Liner eliminates trouble, simplifies mounting, maintenance and service.

Tire and Tube Assembly



A tube is stretched about 20% when it is inflated inside of a tire. When a nail penetrates, it actually creates an opening in the tube, which tends to pull away from the nail, and causes an immediate air loss.

Tubeless Tire

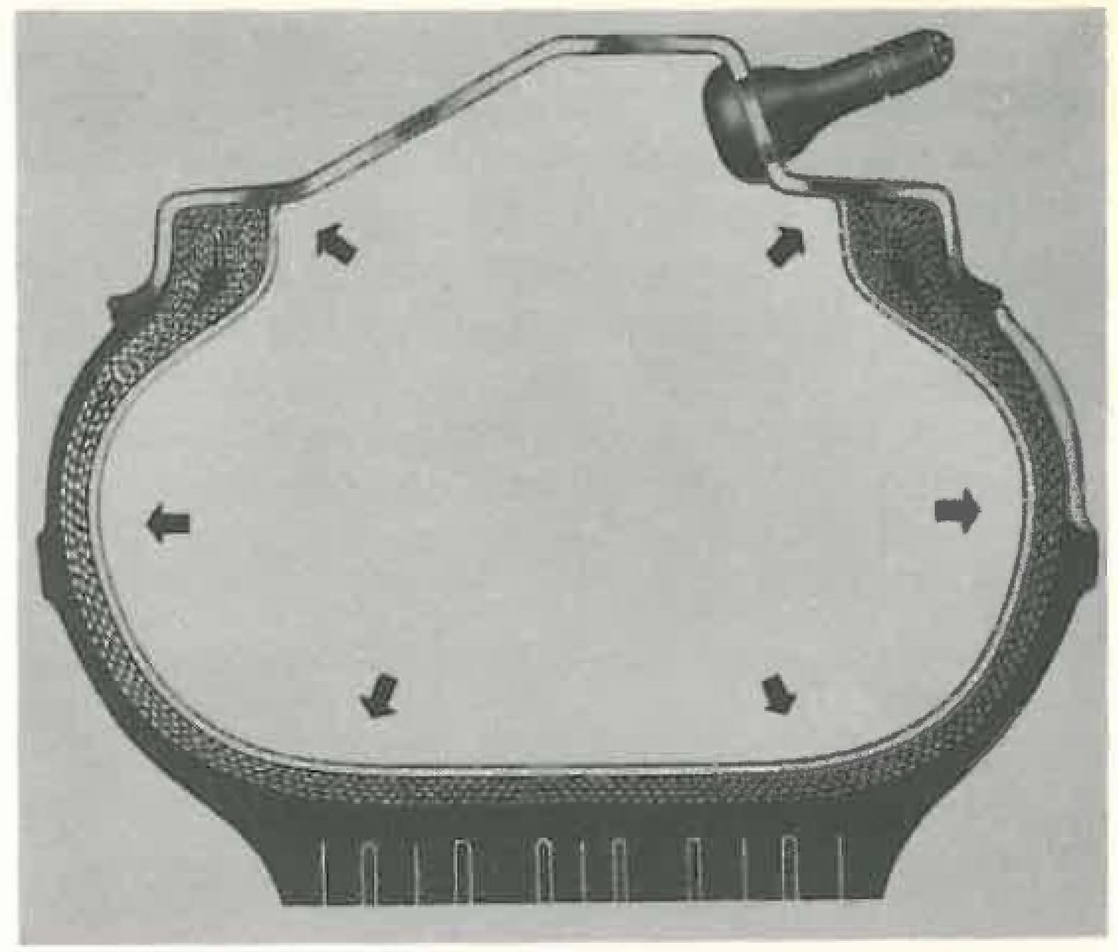


The liner of a tubeless tire, being an integral part of the tire, is relaxed and not under tension. When a nail enters, the liner material clings to the penetrating object forming an effective seal until removed.

How Liner Protects Against Blowouts

No pinching, chafing or buckling at bead seats. Nothing stretched or strained under tread or side walls.

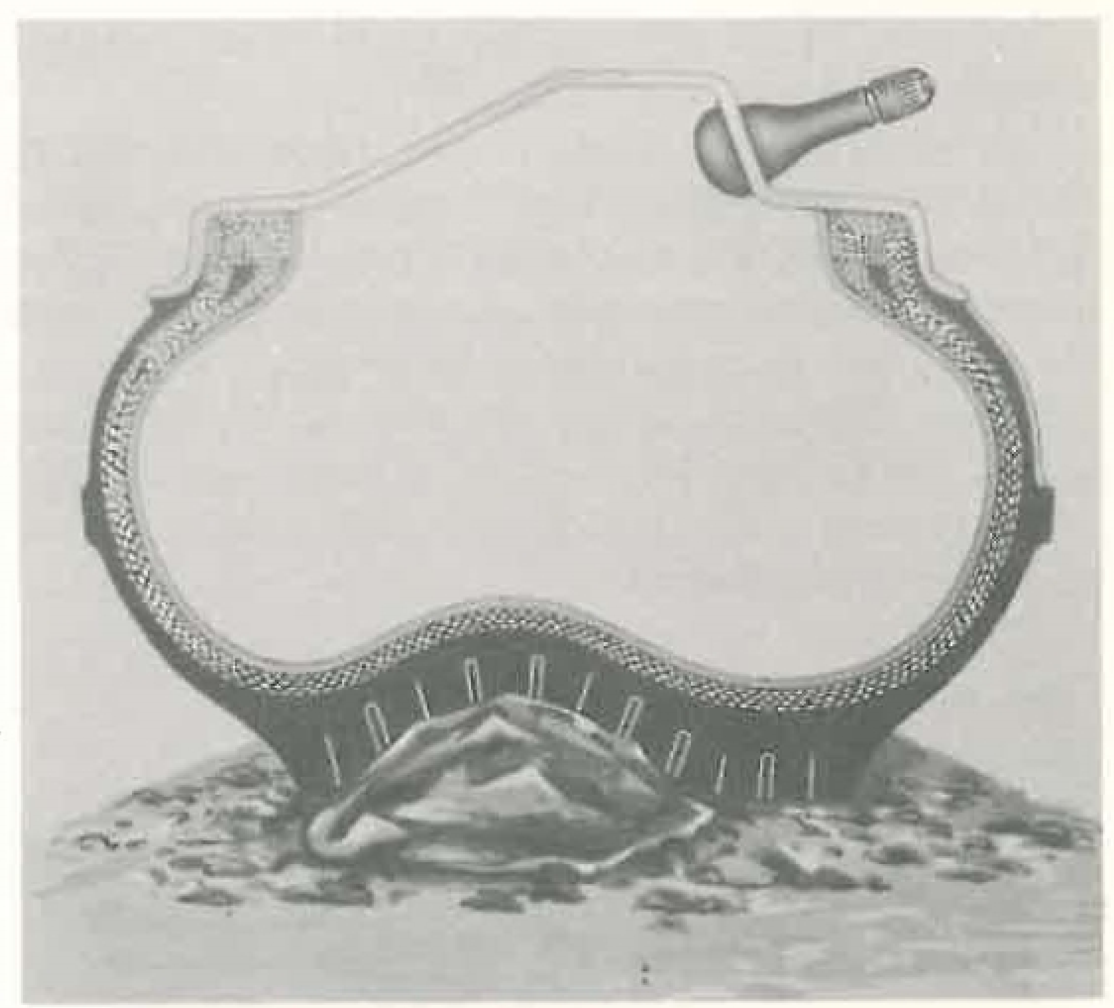
When an impact ruptures the cord body of a tubeless tire, the inner liner contains the average injury, preventing a dangerous blowout. Unlike a tube, which bursts when the cords pinch through, the inner liner



will only develop slow air leakage, giving the operator advance warning.

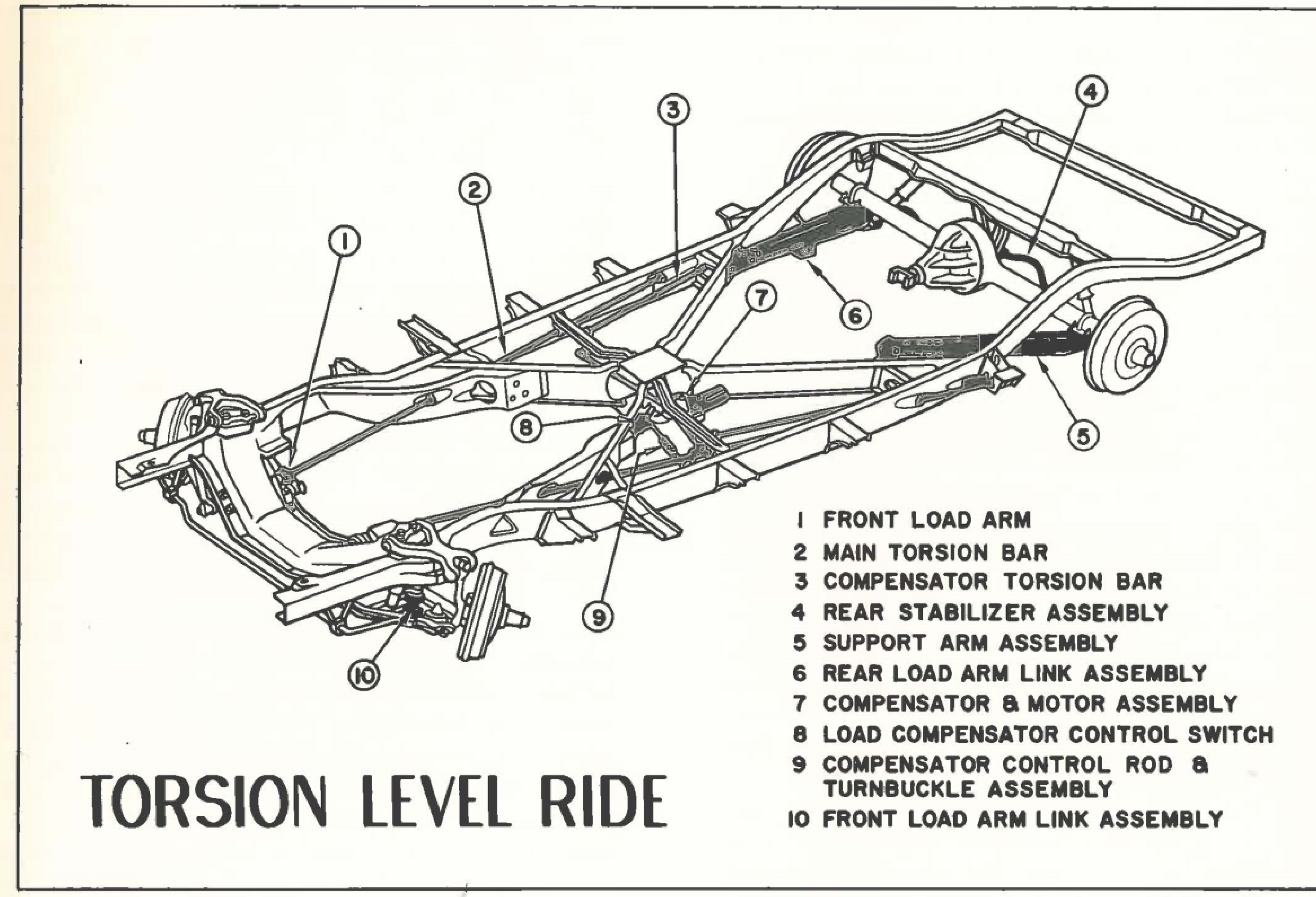
How to repair a tubeless tire is covered in the Service Counselor, Volume 28, No. 1, January, 1954.

How Liner Provides Resistance to Impact Breaks



The tubeless tire, having its built-in inner liner, forms a single unit which flexes as a unit and is actually stronger than the tire and tube assembly.

THE PACKARD TORSION-LEVEL SUSPENSION



Description

The Packard Torsion-Level Suspension is an entirely new suspension which provides the ultimate in riding comfort.

In this new Packard suspension, the front coil springs and the rear leaf type springs have been eliminated entirely. The springs are replaced by two long, torsionally flexible bars, four pivoting arms termed "load arms" and four links. These are the basic details which support the frame and body and provide a car "ride" heretofore unknown with conventional suspension.

Another new Packard feature, which operates in conjunction with the Torsion-Level Suspension, is a levelizing or compensating mechanism which automatically keeps the car level and approximately at its designed height at all times regardless of load.

Front Suspension

The fundamental construction of the Packard Independent Parallelogram front suspension remains unchanged. Minor design changes have been made in various details. The major change is the elimination of the coil springs.

Rear Suspension

Because the rear springs are eliminated in the Torsion Level Suspension, another means of transmitting the thrust of the rear axle to the frame is required to move the car. This is accomplished by two driving torque arms, one at each side of the frame.

The torque arms are attached to the frame at the forward end by rubber cored bushings. The arms also are insulated by rubber at the points of attachment to the rear axle housing. This rubber insulation permits free movement of the rear axle transmitting a minimum of road noises and shocks to the frame.

The arrangement of attachment of the torque arms has three definite advantages:

(1) Due to the reverse torque on the rear axle housing during rapid acceleration, the torque arms tend to raise the rear end of the car thereby preventing rear end "Squat" which is common with conventional suspension systems.

(2) The resistance at the forward end of the arms tends to move the axle housing downward to provide better rear wheel traction during acceleration.

(3) The torque arms pull downward on the frame during brake application and prevents the rear end from pitching upward which is common with conventional springs.

Transverse, or side to side, movement of the rear axle is controlled by two waved stabilizer bars which permit true vertical movement of the rear axle. Rubber grommets at the ends of bars insulate wheel shocks from the frame.

Torsion-Level Suspension

The essential details of the Torsion-Level Suspension are the two, full length main torsion bars, the torsion load arms and brackets and the load arm links.

The main torsion bars, in general, run fore and aft along the frame side rails. Both ends of the bars are hexagon in shape and these fit into the load arms which are hexagon broached at one end.

The front load arms pivot on anti-friction needle type bearings on brackets mounted on the frame front cross member.

The rear load arms also pivot on needle-type bearings in brackets attached to the frame side rails.

The front arms are loaded against anti-friction links which seat in the front suspension lower support arms commonly called "A" frames. The rear arms are loaded against stirrup type links suspended from the driving torque arms. The arms on each side are installed in such a manner that the loaded ends are pointing in opposite directions. In other words, the loaded end of the front arm is pointing away from the center of the car whereas the loaded end of the rear arm is pointing toward the center of the car. With this arrangement, the torsion bar absorbs the torsional loads of both arms and at the same time transmits the load front to rear, and vice versa. This is an important feature, contributing to the flat ride and cornering control. The initial loading of the arms is accomplished by "winding up" or twisting the torsion bar during its assembly in the chassis.

With conventional type suspensions, torsional stresses resulting from vertical wheel movement and spring action are transmitted directly to the car frame. With the Packard Torsion-Level Suspension, vertical wheel movement causes the link end, of the load arms to move vertically. The vertical movement of either arm increases or decreases the amount of twist in the torsion bar which in turn transmits this twisting force to the arm on the opposite end of the bar and the load on the link end of this arm then is increased or decreased. For example: When a front wheel rolls over a hump in the road, the wheel moves upward and the link end of the front load arm, which is pointing away from the center of the car, also moves upward. This upward movement increases the amount of twist in the torsion bar which then transmits a greater twisting force to the rear load arm. The arm, in turn, increases the downward force being applied at the link end which is pointing toward the center of the car. The foregoing may be summarized briefly as follows: The force being applied to move the front load arm is in an upward direction. The force opposing the movement of the rear load arm also may be though of as being in an upward direction. Therefore, the arms are being loaded against each other with the bar absorbing the torsional load. It is this principle which prevents the torsional stresses from being transmitted to the car frame and which provides a flat and level car ride.

In addition to absorbing the torsional stresses created by road irregularities, the load arms and torsion bars also function in a manner which raises or lowers the car, front and rear, on the side where the road irregularity is encountered. For example: When a front wheel rolls over a hump in the road, the entire side of the car raises instantaneously. The upward movement of the front wheel and end of the front load arm increases the loading of the torsion bar. This increased load is transmitted to the inner end of the rear load arm tending to move it downward; however, the rear wheel on the ground prevents its downward movement and the arm pivots causing the outer end to push upward at the same instant the front wheel raises. These instantaneous actions impart a level raising and lowering of the body and, in effect, produces the same result that would be experienced if both the front and the rear wheel simultaneously rolled over humps one-half the size of the hump which originally moved the front wheel upward. It is this principle which greatly minimizes jars and jolts to provide a smooth, level and comfortable car ride.

Compensator

The components described so far would provide a soft, level ride and excellent stability; however, the car would be level for only one load unless some other means of control was provided. Therefore, the car levelizer or compensator is incorporated to keep the car level and approximately at the design height at all times regardless of load.

Basically, the compensator consists of torsion bars approximately four feet long, connected by means of levers and links to a two-way motor with reduction gearing.

The forward end of the compensator bars rotate in bearings attached to the frame. The hexagon rear end of the bars fit into the rear load arms in milled hexagon openings adjacent to the main torsion bar openings. Bar type links are connected to the compensator gear

box at their inner ends and, at their outer ends, to levers attached to the front end of the compensator bars.

Six switches are used in the compensator electrical system to control its operation:

1. An "On-off" switch located below the instrument panel to the left of the steering column. This switch normally is in the "on" position and is moved to the "off" position to prevent the compensator from operating when the car is raised such as for changing a wheel and tire or to perform service operations.

2. A three terminal two-way stop light switch is used to prevent compensator operation during brake application.

3. A control switch is used to energize the compensator motor when the car load is increased or decreased.

4. A limit switch is employed which permits the compensator motor to operate only within a predetermined range in accordance with load changes in the car.

5. Two solenoid switches are used to complete the electrical circuit to the compensator motor, one for each direction of rotation of the motor.

The control switch assembly is attached to the frame and a lever in the switch is linked to a lever clamped to the left main torsion bar near the center of the bar. Rotation of the center of the main torsion bar in either direction causes the switch to "make" and "break" the circuit to the compensator motor. The switch has approximately a seven-second delayed action to prevent the motor from operating each time the wheels pass over an irregularity in the road.

In operation, with the front and rear of the car equally loaded, the center section of the main torsion bar has no rotation due to the equal twisting forces being applied from each end of the bar. When the loading at either end of the car is increased or decreased, the center section of the main torsion bar will rotate causing the control switch to make contact and operate the motor. This causes the connecting links to move inward or outward to rotate the compensator bars. The bars, in turn, cause the rear load arms to pivot and either raise or lower the rear end of the car to make it level with the front end. Thus, regardless of weight distribution, the car will always be level to the road, front and rear, with very little change in car height.

It should be remembered that the compensator functions only when the loading of the car is changed and does not function to compensate for road irregularities.

SERVICING THE TORSION-LEVEL SUSPENSION

Torsion Bar Removal

Under normal car operation, the torsion bars should never require replacement; however, this may be necessary if the car is involved in a collision which damages the frame. Certain service operations on the suspension system require the unloading of the bars. The following procedure describes the removal and installation of the main torsion bar on the right side of the car.

Position the car over a hoist and then move the "on-off" switch, located under the instrument panel to the left of the steering column, to the "off" position. Raise the car and remove the rear wheel.

NOTE: When raising the car, stop the rear lift of the hoist about three inches below its fully extended position so that it can be raised or lowered slightly in later operation.

Figure 1 shows the compensator bar lever in the posi-

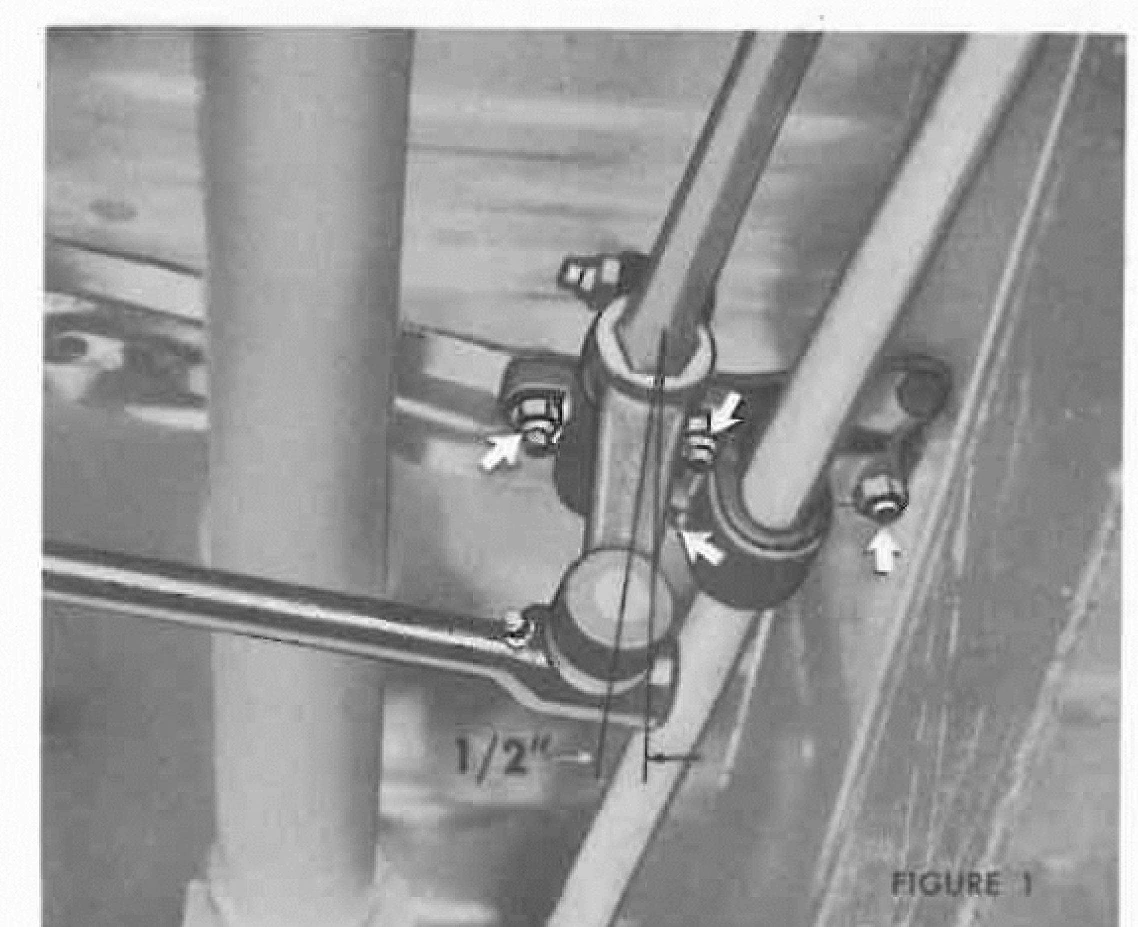


FIGURE 1

tion at which no load is being transmitted through the bar. Note that the lever is just off vertical toward the center of the car. The levers can be moved by grounding a terminal at the limit switch. See figure 2. Ground the rear terminal to move the lever outward or the front terminal to move the lever inward.

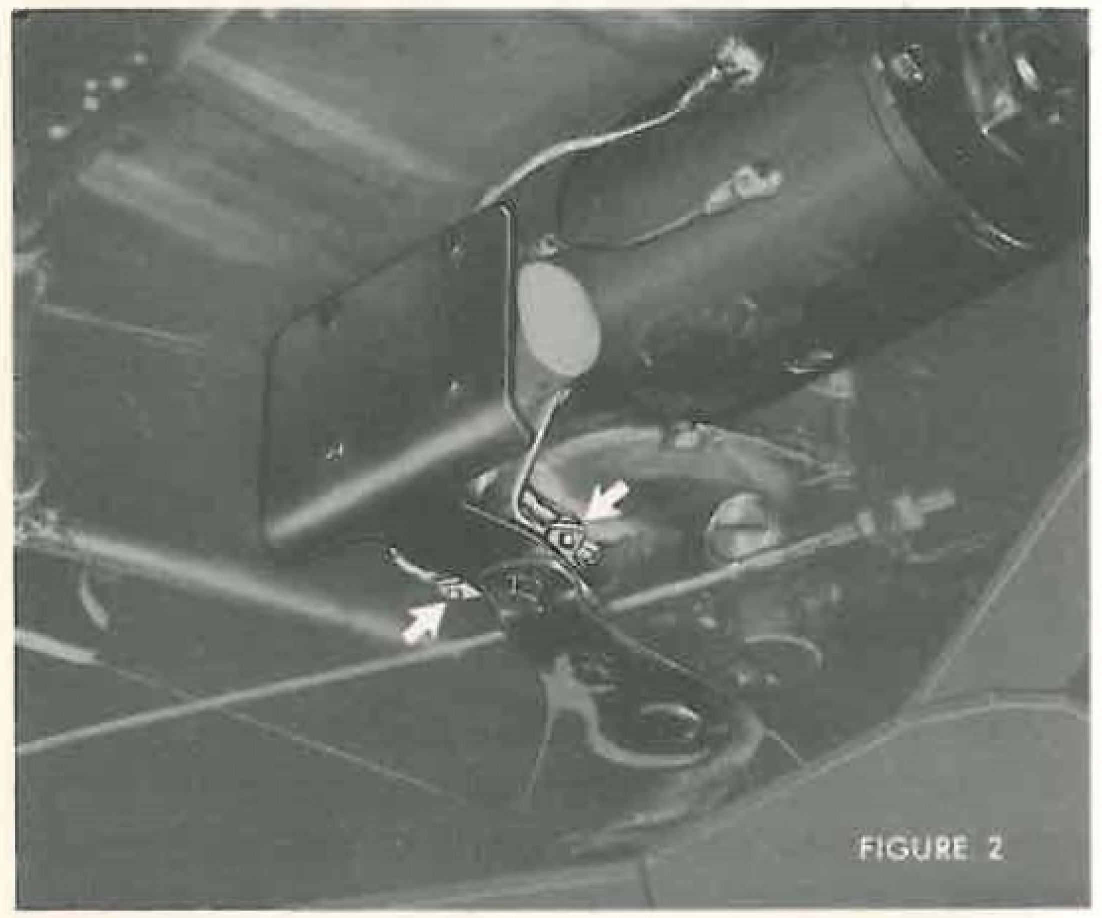


FIGURE 2

Place high-jacks under the frame at all four corners, front and rear, and then extend the jacks so that the pads contact the frame. See figure 3.

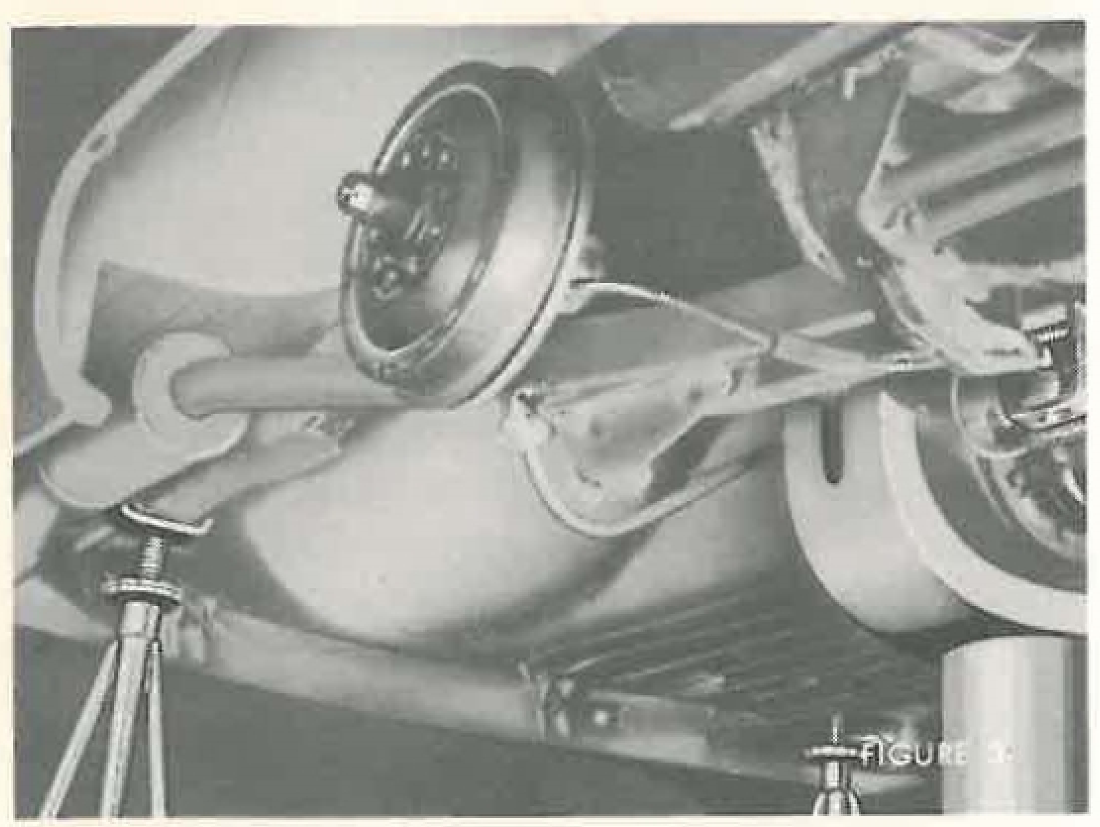


FIGURE 3

NOTE: If a frame-contact type hoist is used, place the high-jacks under the rear axle housing and under the outer ends of the front wheel lower supports.

Remove the four nuts indicated in figure 1 and remove the rubber guide bearing and retainer. If the left torsion bar is being removed, detach the lever shown in figure 4 from the bar.

Loosen the rear load arm clamping nut using a $1\frac{1}{16}''$ socket and offset handle. See figure 5.

Tap the compensator bar forward with a brass drift and out of the load arm as shown in figure 6.

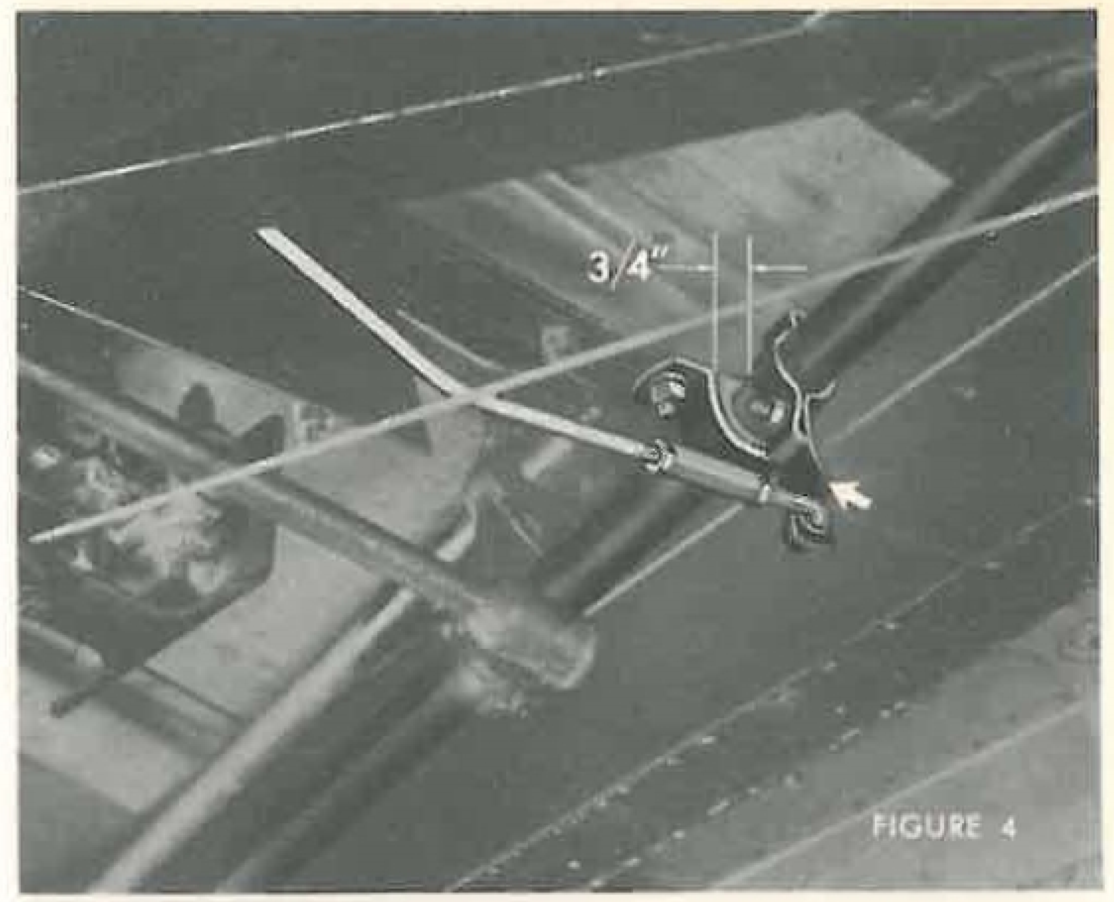


FIGURE 4

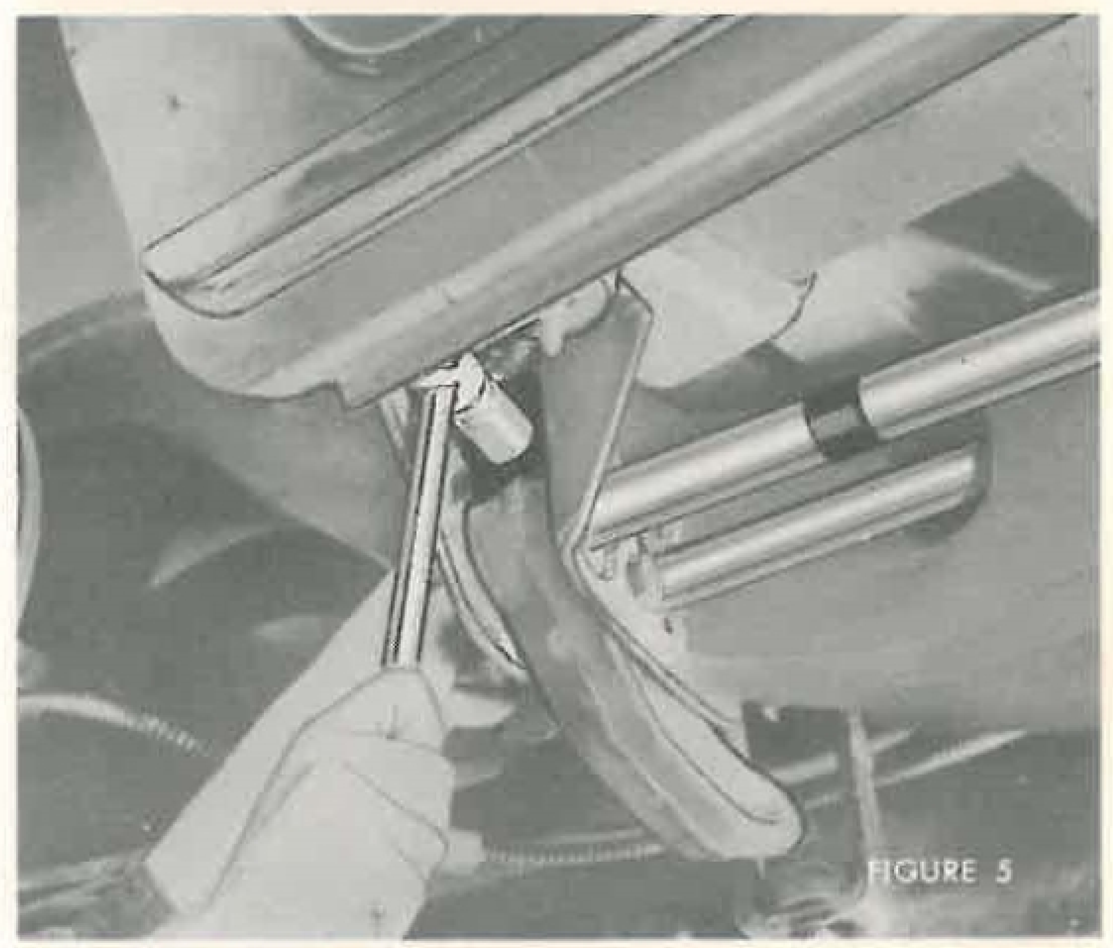


FIGURE 5

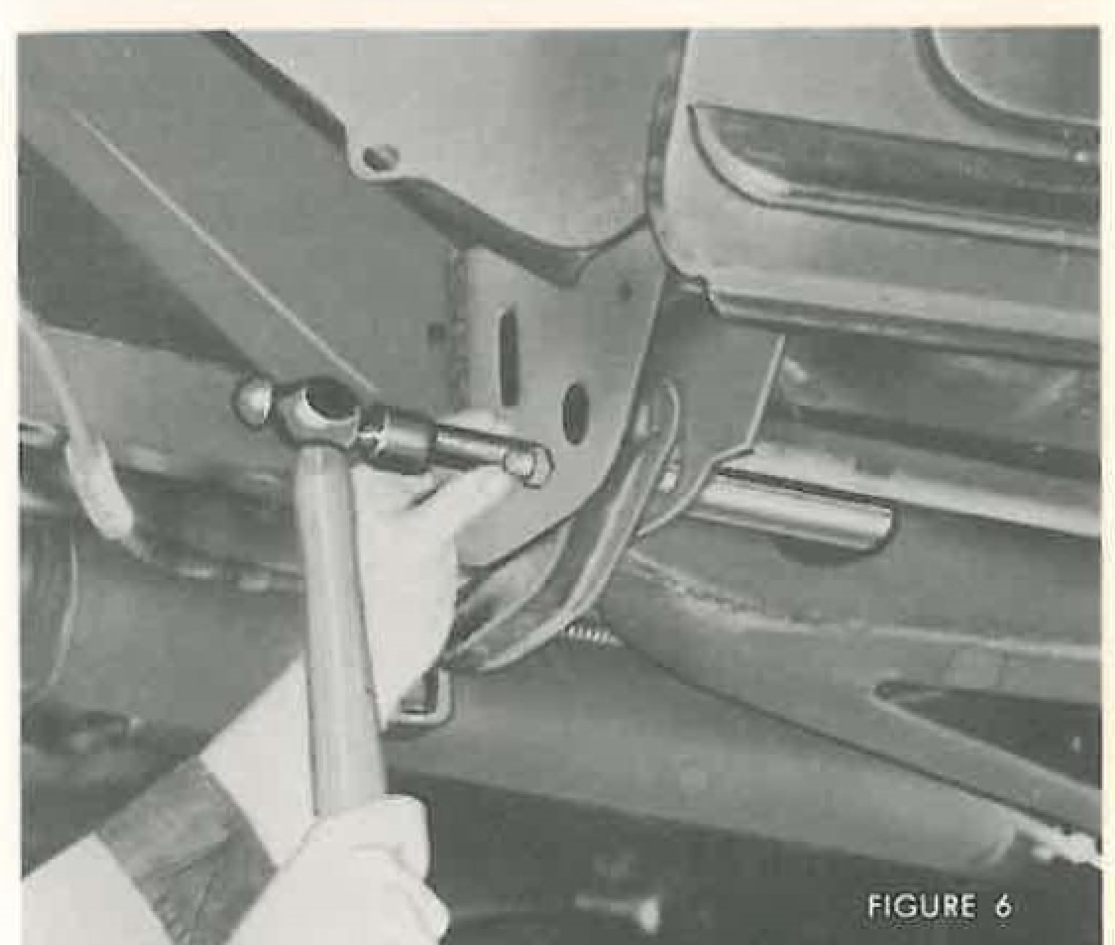


FIGURE 6

Slightly raise or lower the hoist rear lift, if required, in order to centralize the hex in the arm with the hole in the bracket. See figure 7.

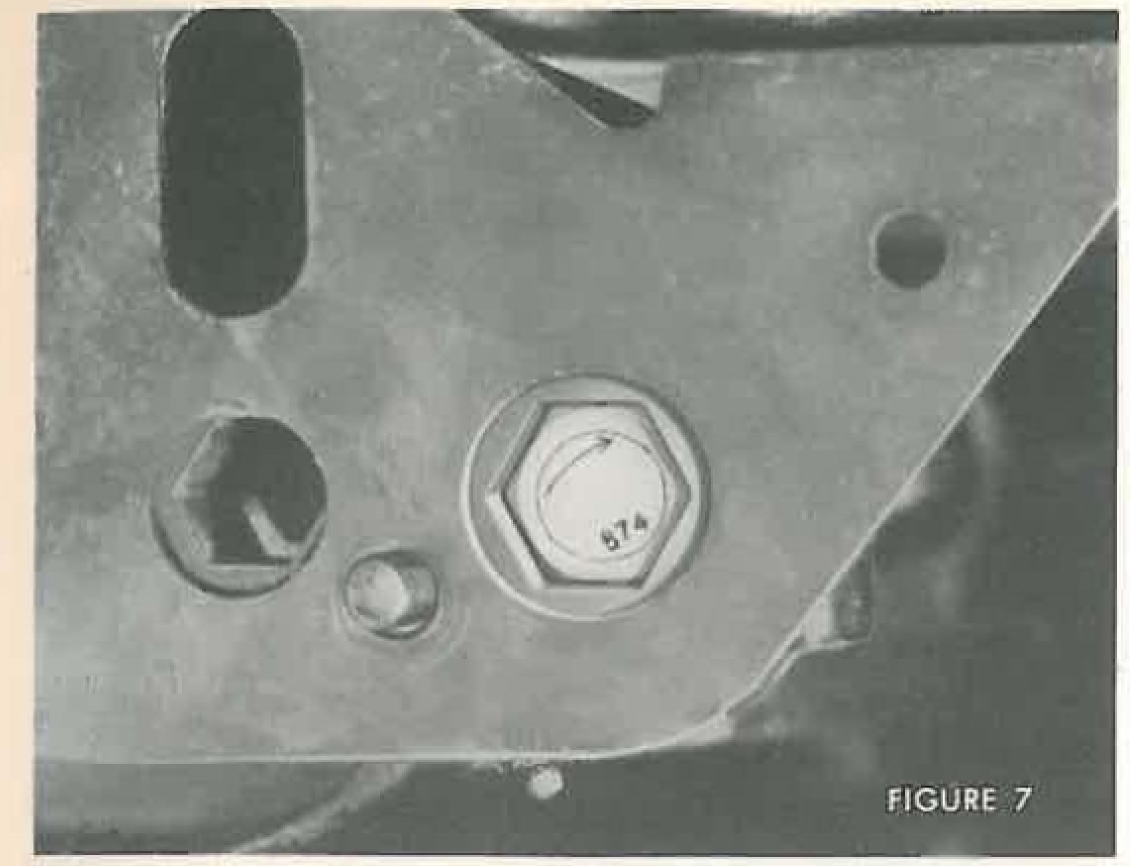


FIGURE 7

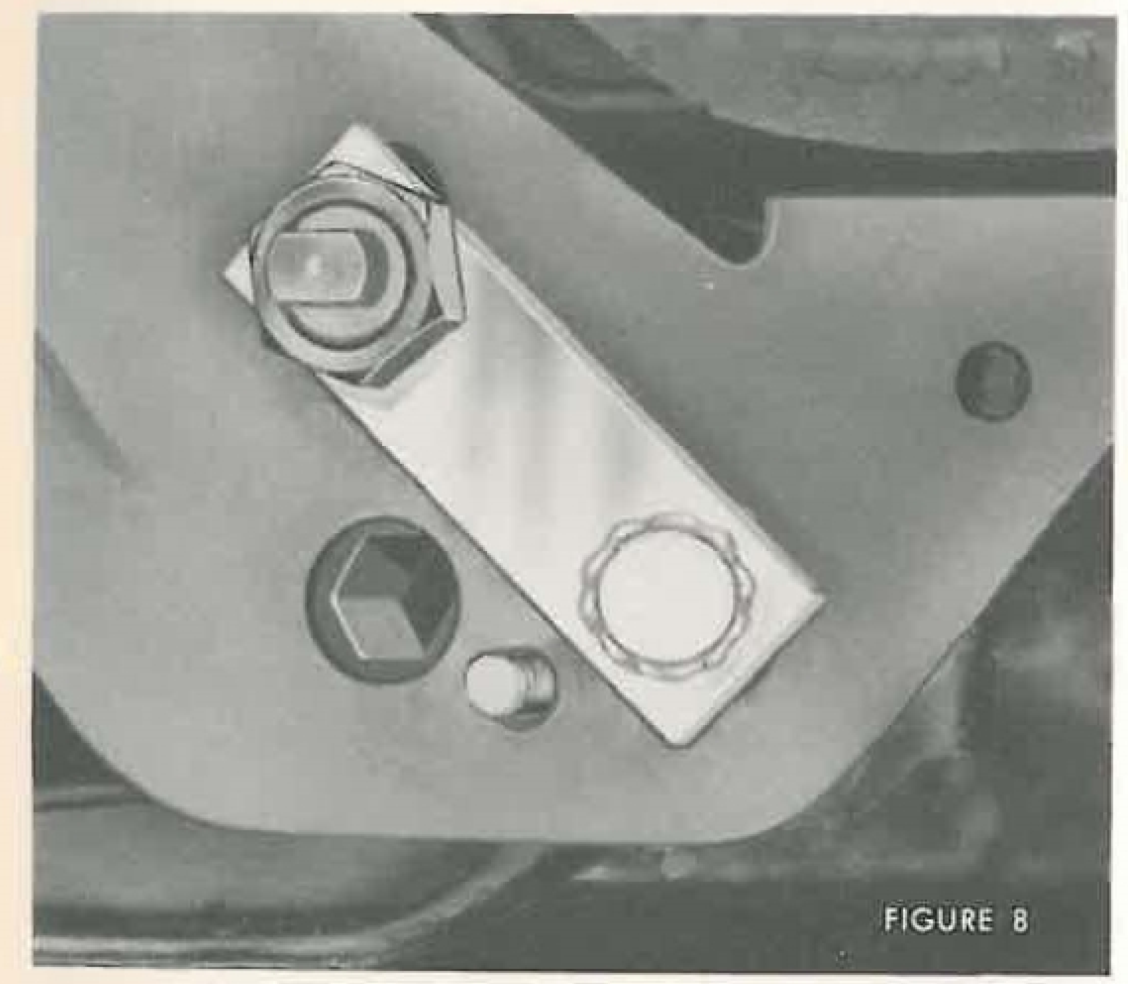


FIGURE 8

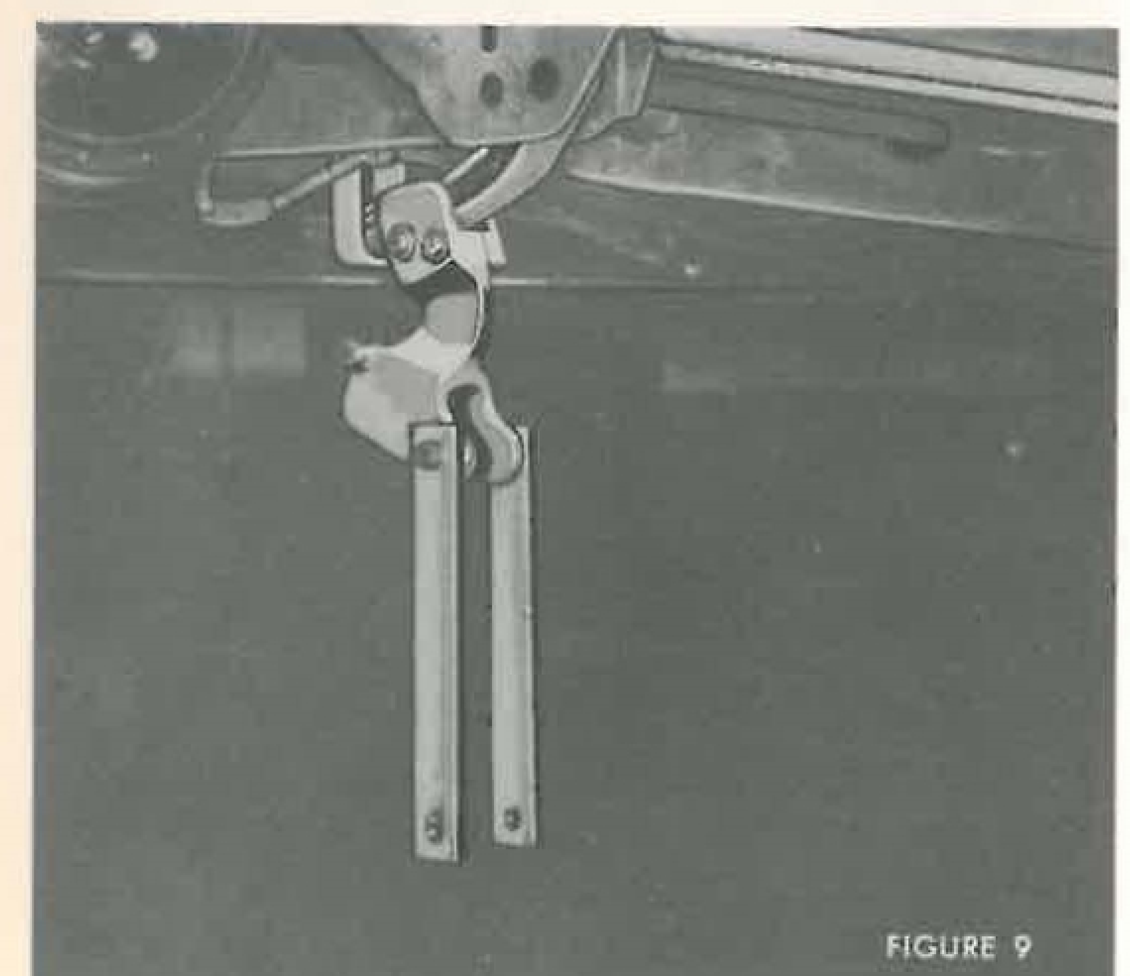


FIGURE 9

Attach the Load Arm Centering Tool J-6045 as shown in figure 8. Make certain that the piloting shoulder at the lower end of the tool is in the hole in the bracket, then tighten the locknut.

Attach the clamping detail of the Torsion Bar Loading and Unloading Tool J-5954 to the load arm as shown in figure 9. Complete the special tool hook-up as shown in figure 10. The hole in the frame for attaching the "U" detail is in line with the front of the brake drum.

FIGURE 10

Operate the jack handle to move the inner end of the load arm upward far enough to centralize the pivot bolt in the bracket hole as shown in figure 11.

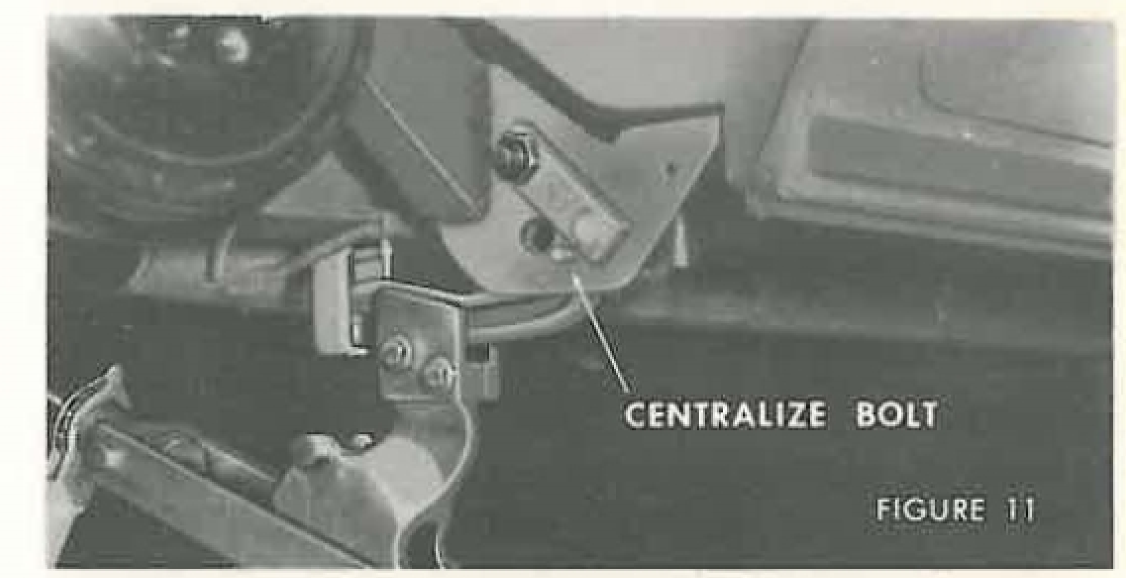


FIGURE 11

Use a brass drift and tap the pivot bolt out as shown in figure 12.

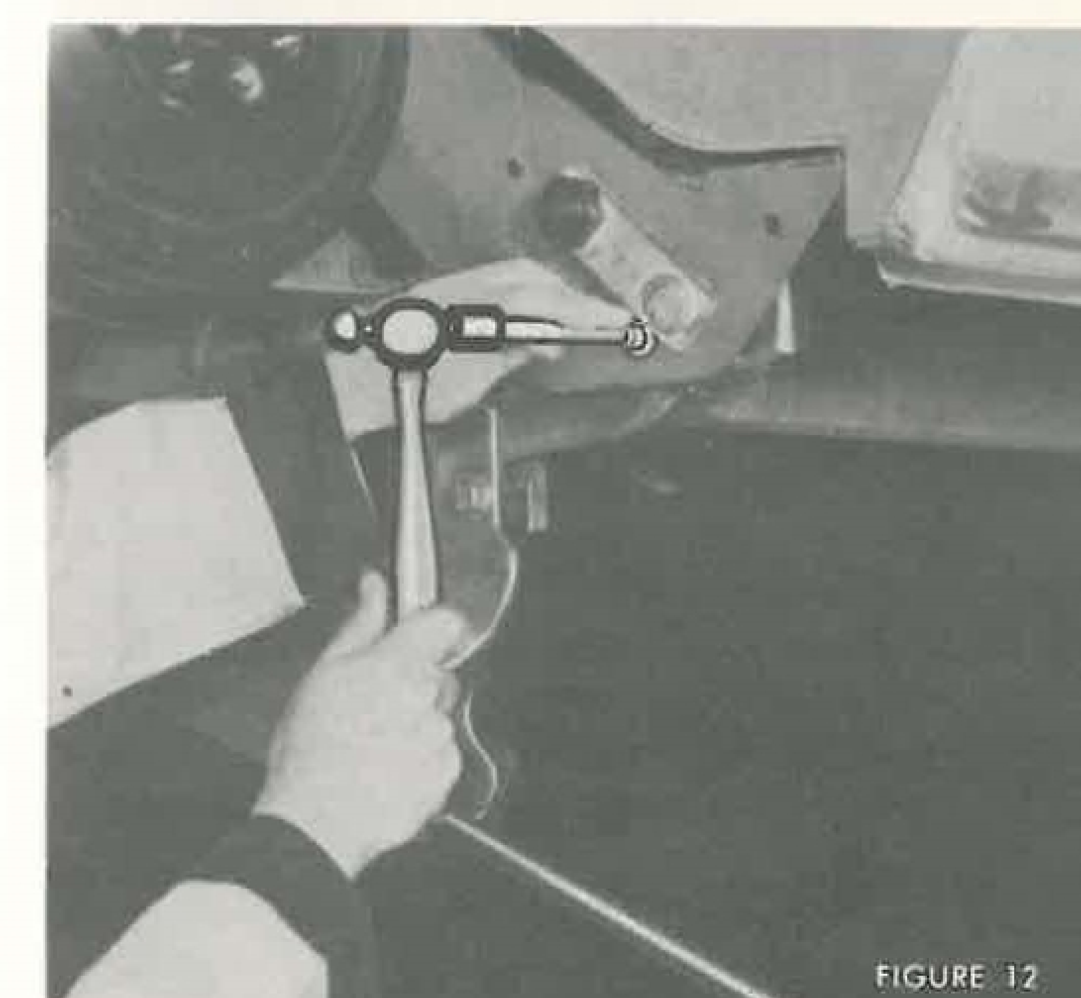


FIGURE 12

Tighten the tool jack to move the inner end of the load arm upward and move the load arm link inward as shown in figure 13. Place a four inch block between the rear axle case and the bottom of the frame "kick-up."

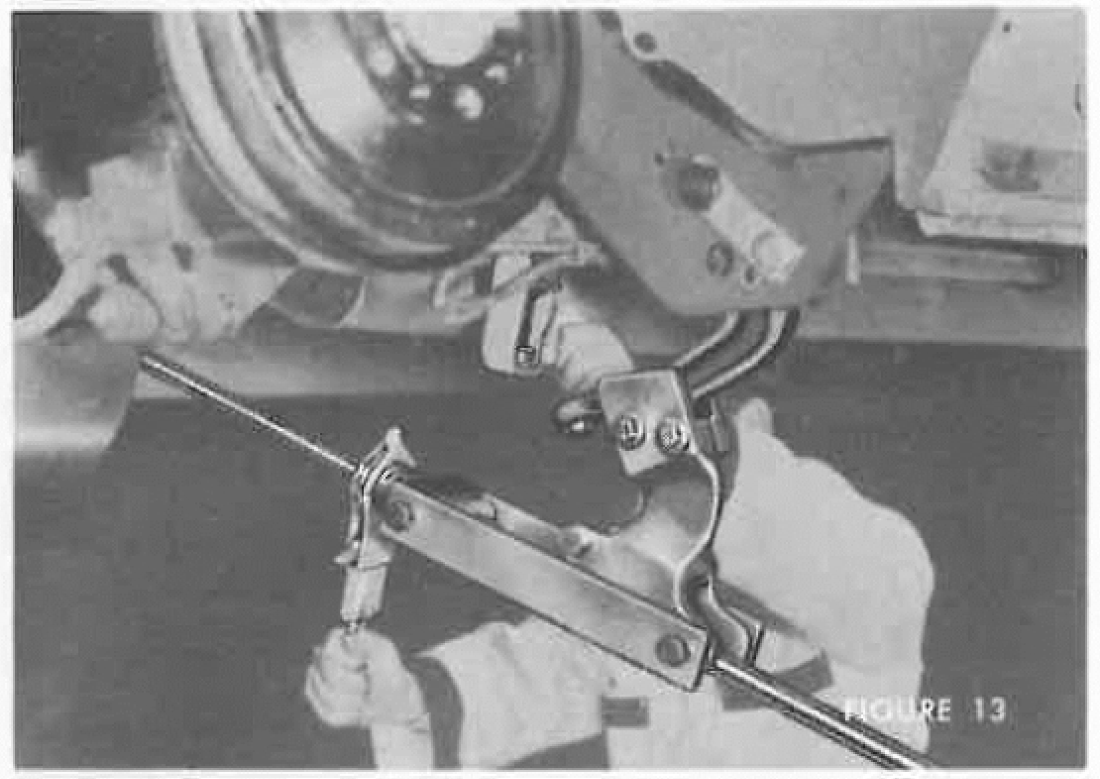


FIGURE 13

While holding the link inward, reverse the tool ratchet and lower the inner end of the load arm as shown in figure 14.

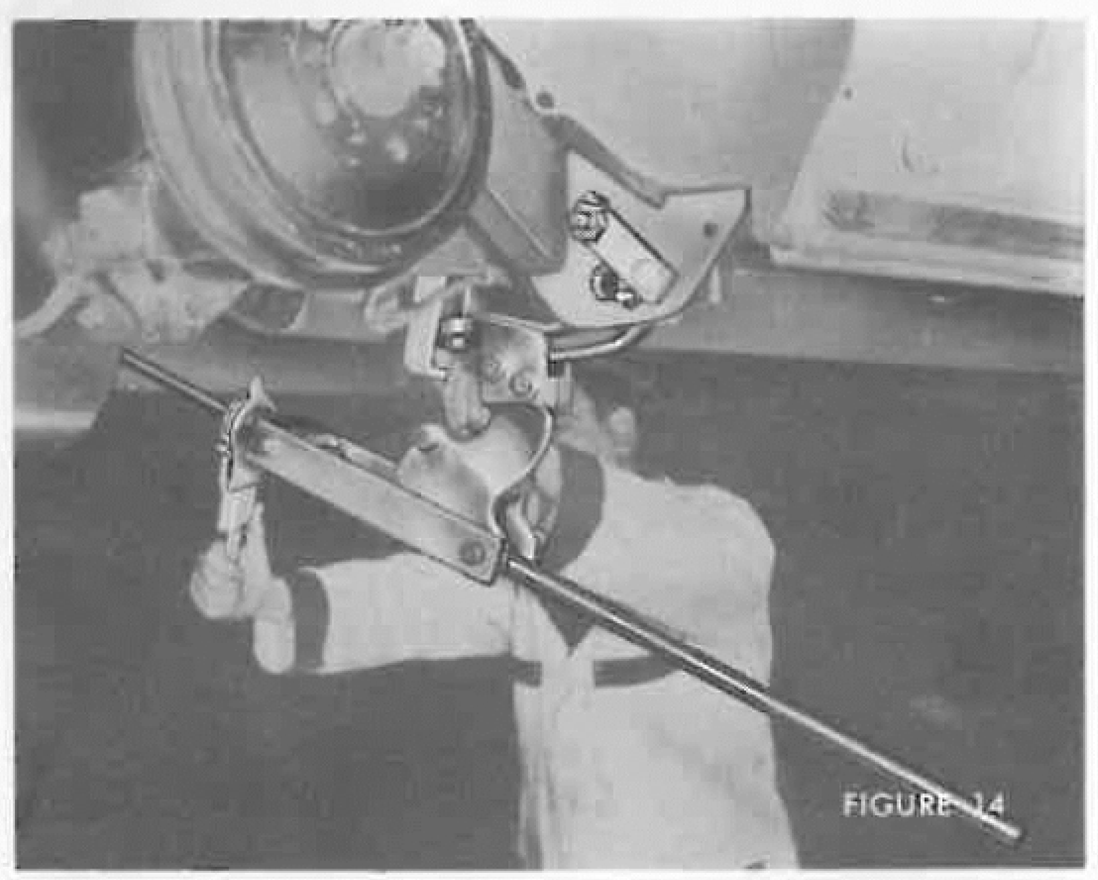


FIGURE 14

After the arm is lowered, remove the tool clamp, attach the Removing Tool J-6046 and knock the bar rearward as shown in figure 15. Remove the tool and push the bar out toward the rear as shown in figure 16.

Torsion Bar Installation

Feed the bar in from the rear and through the rear load arm. Refer to figure 17 and note the arrow and number in the end of the bar. The arrow denotes the direction in which the bar should be "wound up." The number represents the last three digits of the part number of the bar.

Feed the front end of the bar into the front load arm as shown in figure 18. Make certain that the load arm link is in the position shown in figure 19.

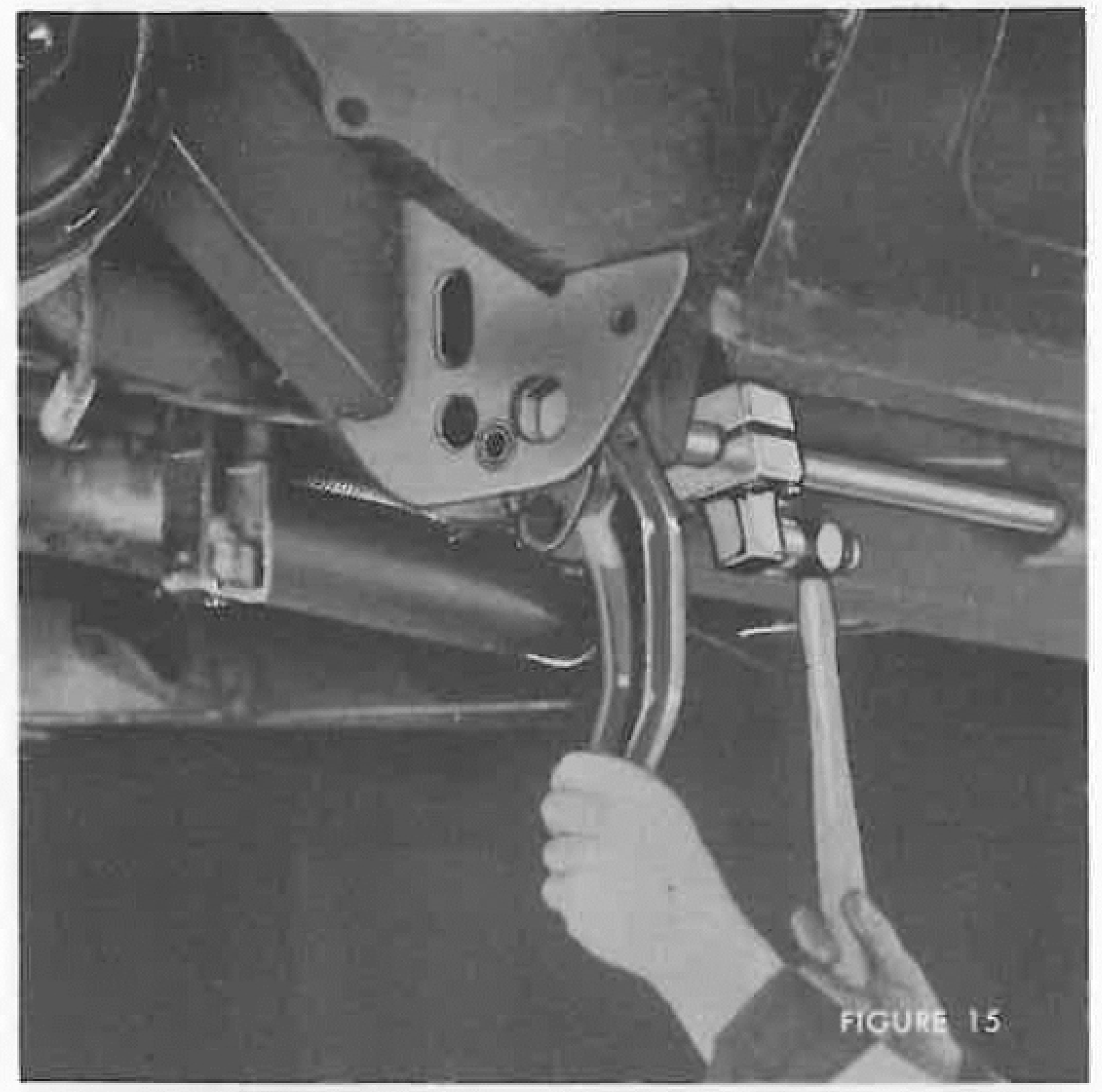


FIGURE 15

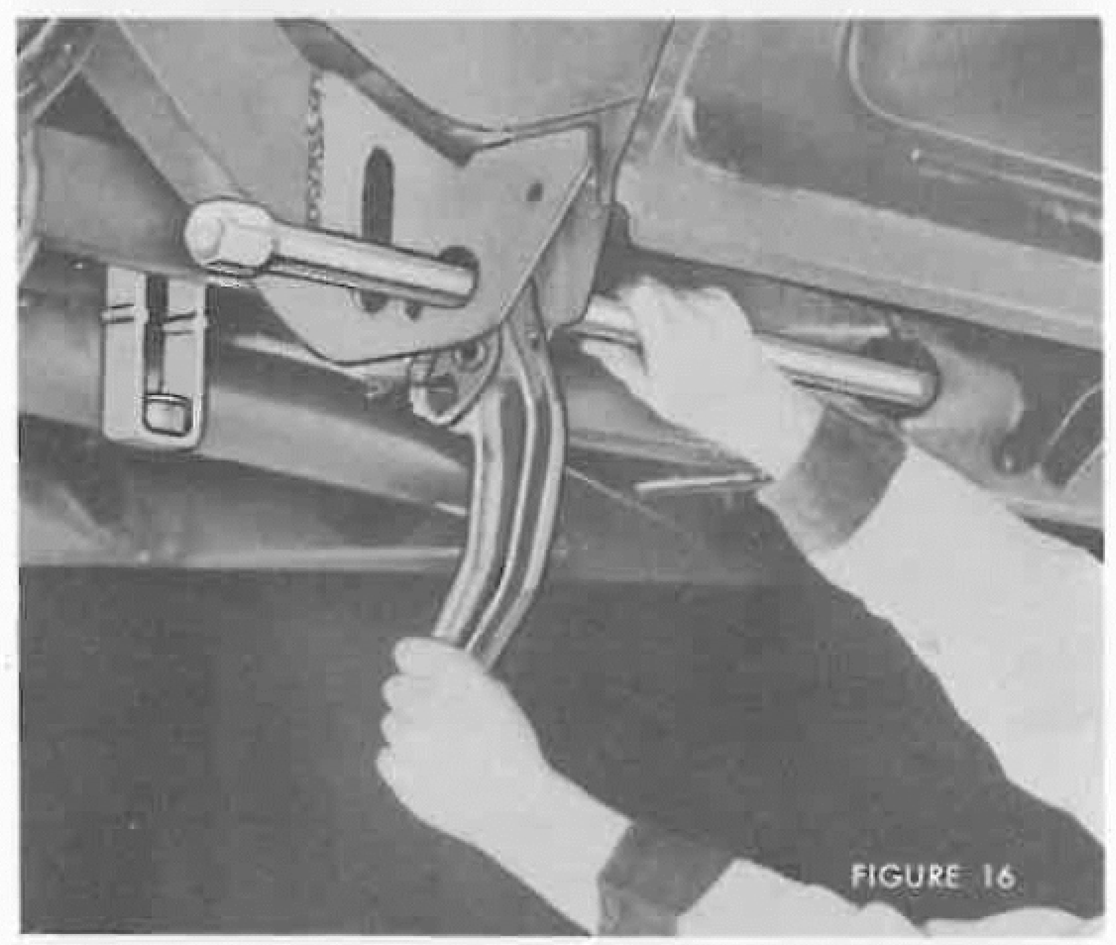


FIGURE 16

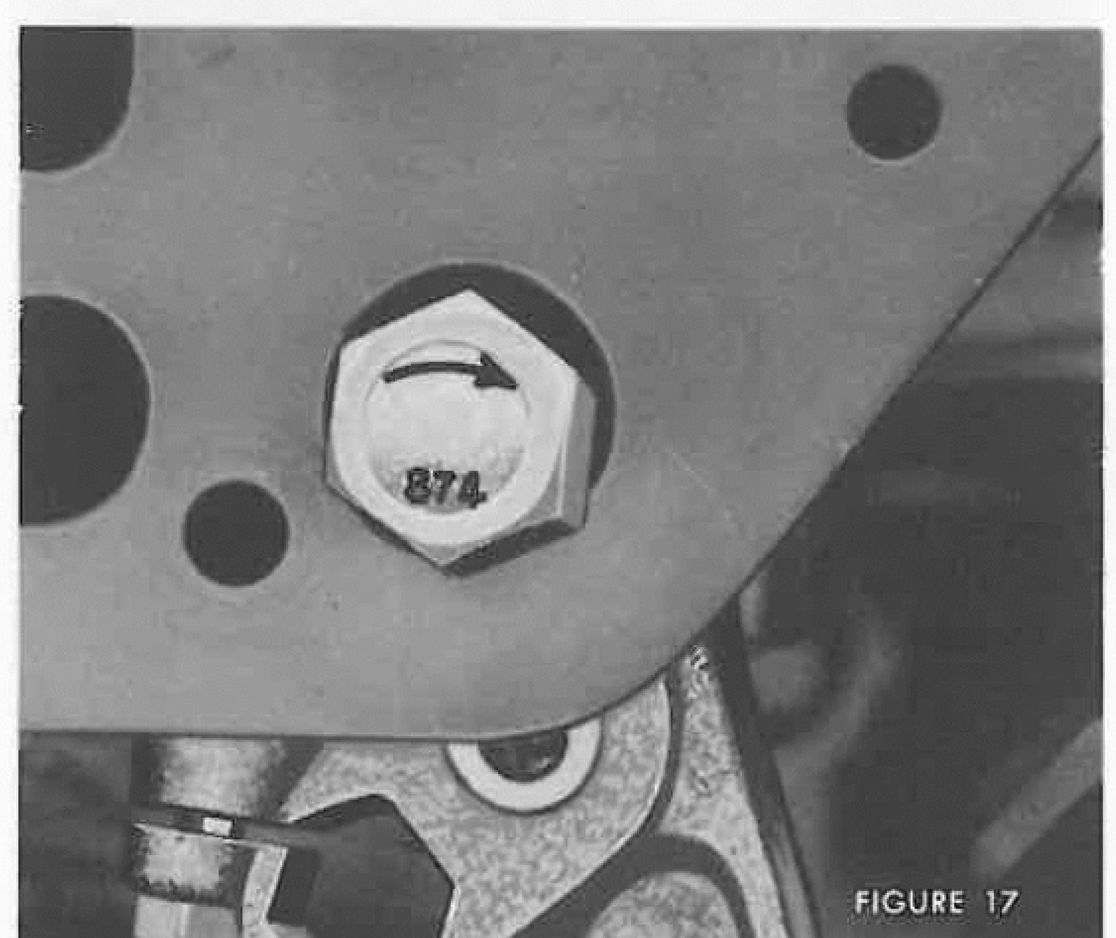


FIGURE 17

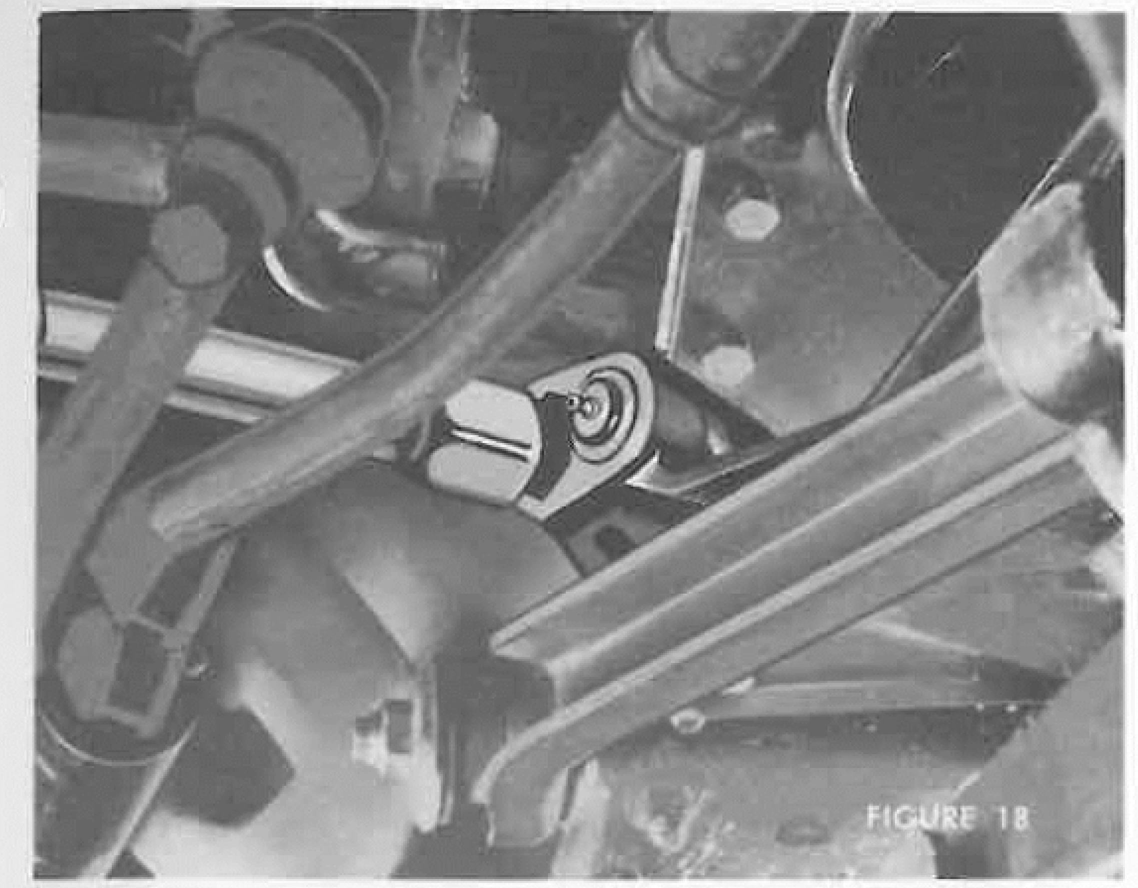


FIGURE 18

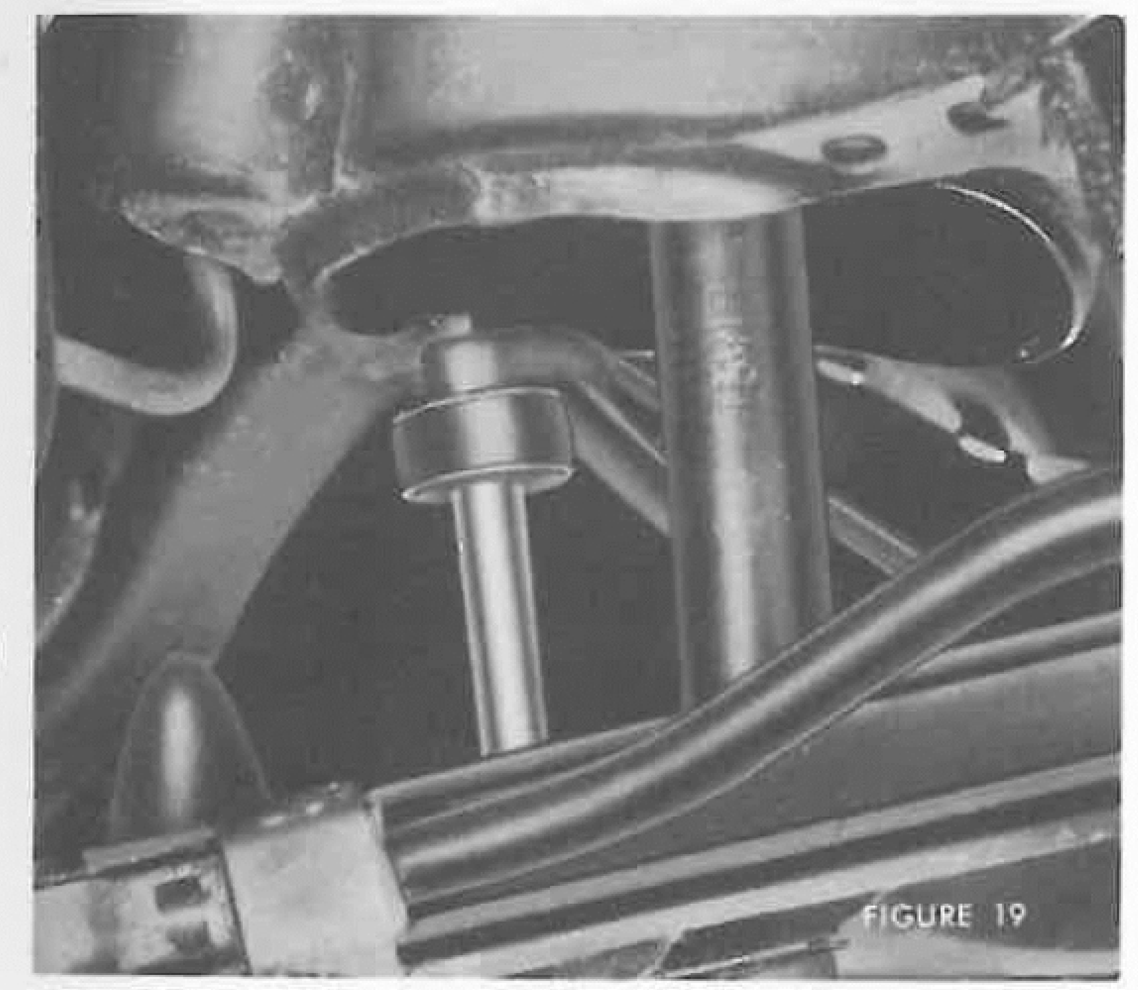


FIGURE 19

Refer to figure 20. The distance from the rear end of the torsion bar to the rear face of the bracket should be ¾". The arm also should be centralized in the bracket.

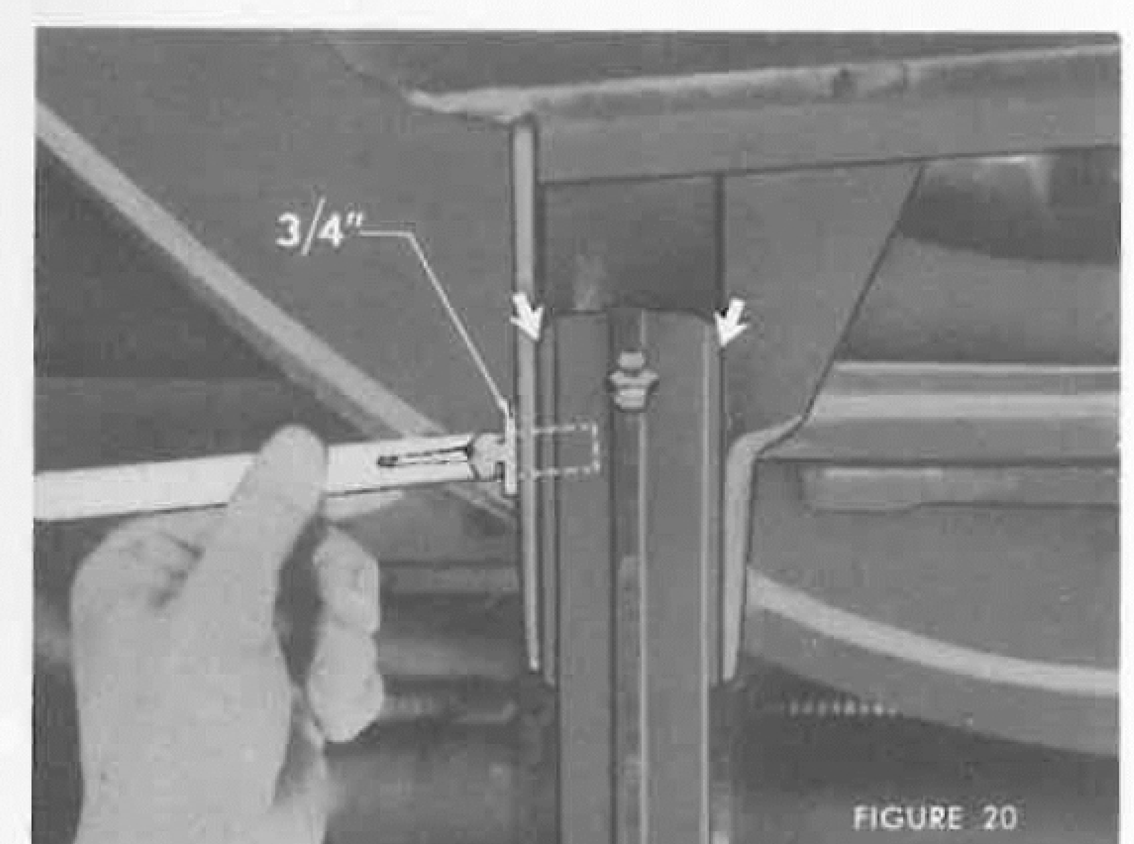


FIGURE 20

Figure 21 shows the rear arm in its proper position, which is nearly vertical with the clamping detail attached and the centering tool J-6045 in place.

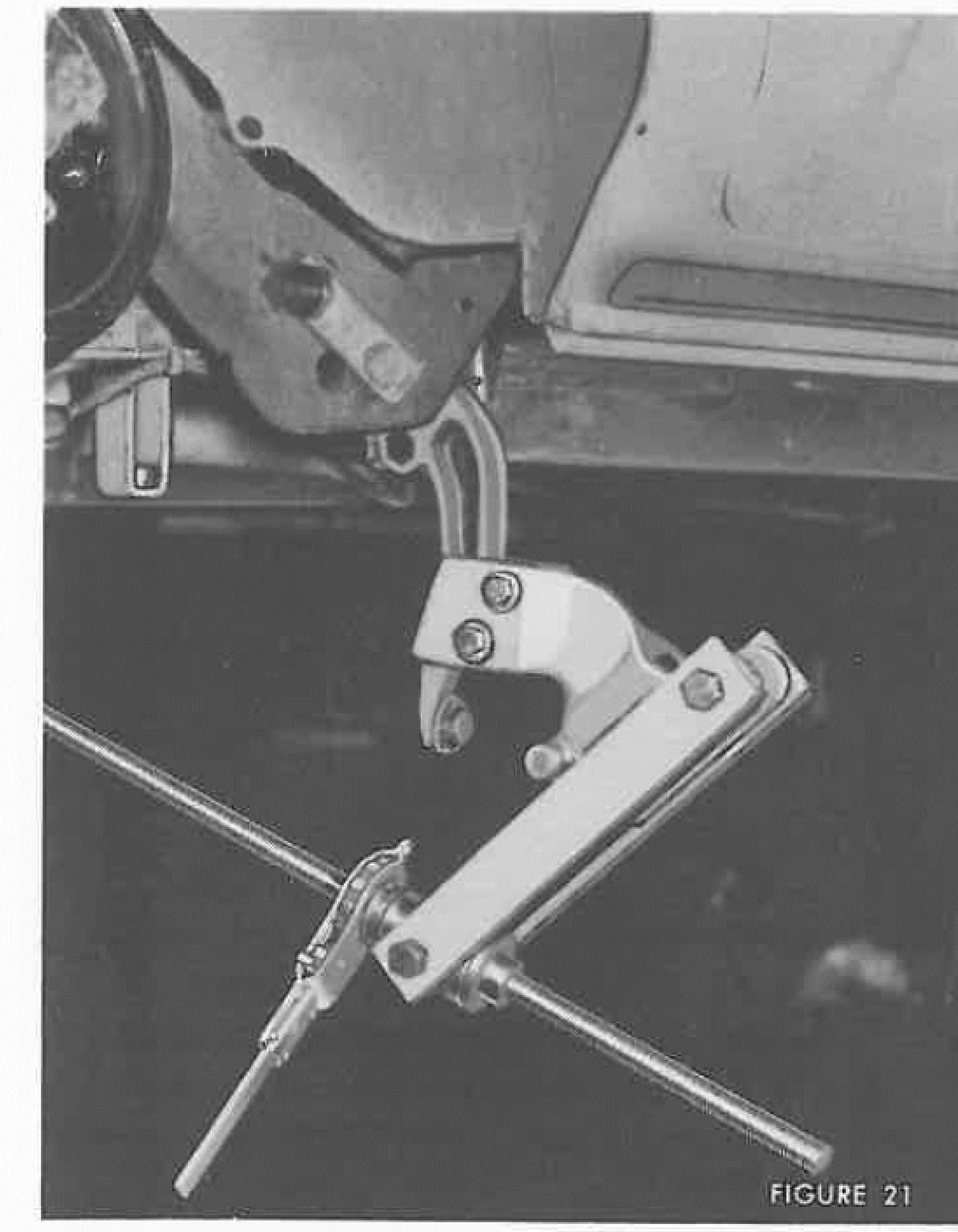


FIGURE 21

Place special lubricant (available through Central Parts Warehouse) in the seat in the load arm link.

Connect the tool jack to the clamp on the load arm. Operate the jack to draw the load arm up into position. Draw the arm upward until the pivot hole in the arm lines up with the pivot holes in the bracket and then insert the pivot bolt. Continue to draw the arm upward while holding the link inward until the link can be swung outward under the arm and then back off on the jack to seat the arm.

Position the compensator bar in the rear load arm and attach the bearing at the front of the arm to the frame. The seal between the bearing and lever should not be squeezed together, but should contact both the bearing and the lever. Tighten the clamping nut in the rear load arm.

If the left torsion bar was replaced, attach the compensator motor linkage so that the rear edge of the clamping lever is ¾" from the front edge of the rubber guide bearing retainer. See figure 4.

Adjusting Compensator Linkage

Set the car on its wheels. If the rear end of the car is too high, shorten the compensator switch turnbuckle link. If the rear end is too low, lengthen the link.

Lubrication

The Torsion-Level Suspension incorporates ten lubrication points which should be lubricated with pressure gun grease at 1,000 mile intervals.

Whenever torsion bars are replaced or unloaded for other service operations, the link seats should be lubricated with a special grease available through the Central Parts Warehouse.

Service Precautions

Care must be exercised when raising a car with Torsion-Level Suspension, either on a hoist or with floor jacks. The lower ends of the front shock absorbers extend below the lower wheel support arms and these ends can be damaged if the arms do not seat properly on the hoist or jack.

A Torsion-Level Suspension car should never be jacked up in the rear with the jack or hoist under the rear load arms as the rear load arm link may become disconnected.

COMPENSATOR ELECTRICAL SYSTEM

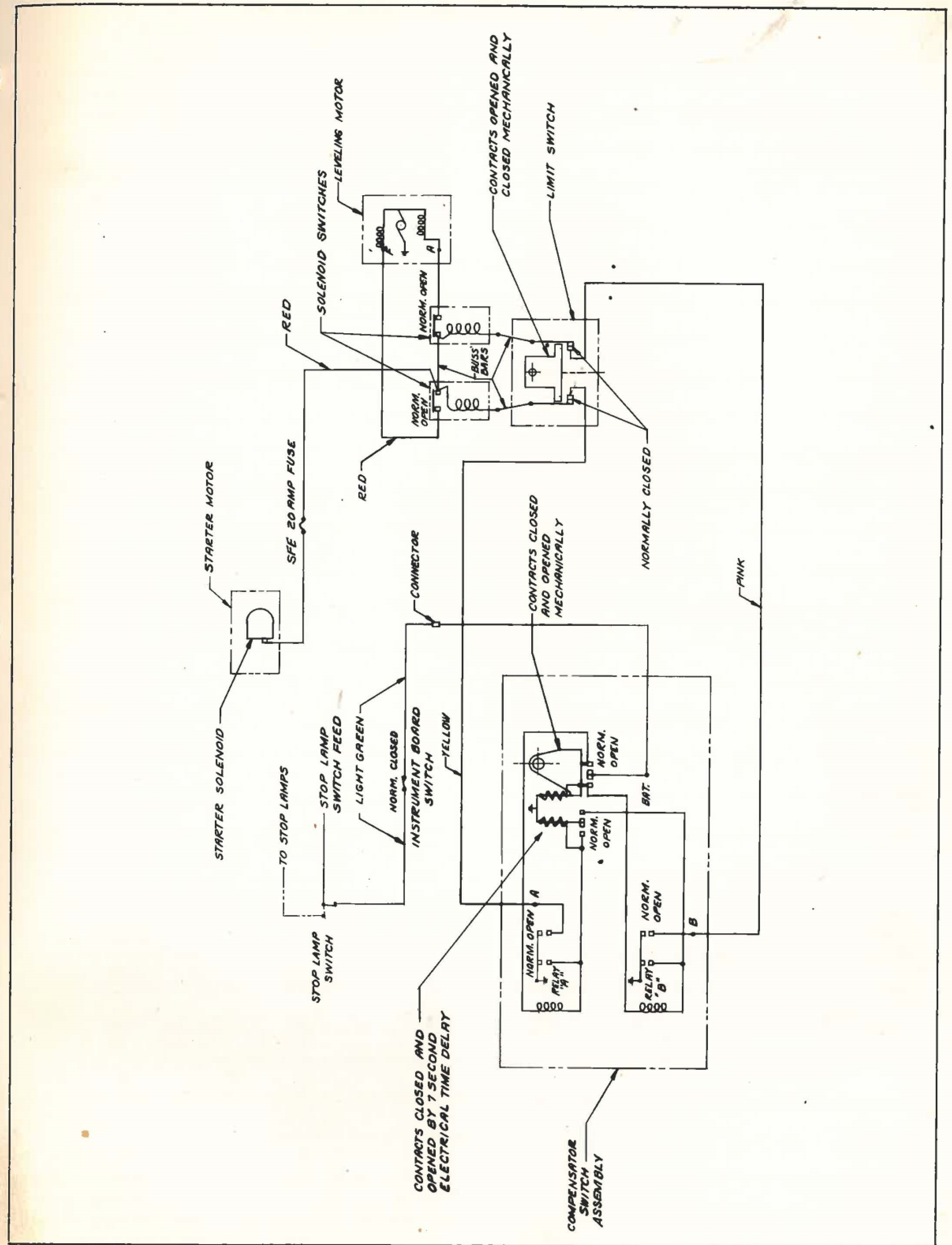
Two 20 ampere fuses control the flow of current to the compensator electrical circuit. One 20 ampere fuse is located in a fuse block under the instrument panel near the plenum chamber. There are approximately six fuses in this block and the fuse sizes are marked in the holders, only *one* 20 amp fuse is in this block which is for the stop light circuit and also the compensator switch circuit. From the fuse block this current goes to the stop light switch, then to the instrument board switch and then to the compensator switch.

The other 20 amp fuse is located in a cartridge type holder in the wire coming from the starter motor and located near the starter motor. The current coming through this fuse goes to the relays and drives the compensator motor.

In the event that the levelizer does not operate a quick check can be made as follows:

1. With the dash compensator switch *on* apply the brakes, the stop lights should light, if not the 20 amp fuse may be blown or the stop-light switch may be disconnected.
2. If the above is found O.K., check the 20 amp fuse located near the starter motor, or check as follows: There are three terminals on the control switch, one marked "BAT" and one each marked "A" & "B". Grounding A or B should operate the compensator motor. Grounding terminal B raises the rear end of the car. Grounding terminal A lowers the rear of the car. If the compensator has already reached its maximum travel one of the A & B circuits will be interrupted in the limit switch. However, the other circuit will be energized. If the levelizer does not operate while grounding, it can be assumed that current is not being supplied through the fuse.

In the event of malfunctioning controls such as the compensator control switch assembly, limit switch or solenoid switches, no attempt should be made to repair these parts. Replace the faulty parts. The electric motor brushes and commutator shall be serviced the same as a starting motor.



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