PACKARD
Service Counselor
PARTS ★ ACCESSORIES ★ PRODUCT ★ PROFITS
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SERVICING THE TRANSMISSION

The surest way to obtain consistently good results when overhauling major units of the car is to adopt a uniform procedure to be used every time a like unit is reconditioned.

When a uniform procedure is followed the customer benefits by having a thorough job done. The Dealer and mechanic benefit in the time saved by doing the job systematically.

The following procedure for overhauling the transmission will, if followed, result in increased customer satisfaction and less corrective labor in the shop.

CLEANING

Cleaning of the transmission unit before disassembly should be divided into two operations. First, the outside of the case and cover should be washed with kerosene to remove all dirt and grit, the container emptied and clean kerosene added. Second, remove the cover and flush and clean the inside of the case and the internal parts. (With the cover removed, cleaning both the inside and outside in one operation may result in dirt and grit getting into the transmission bearings.)

DISASSEMBLY

Cover

Remove the complete cover assembly from the transmission case. Remove the first and reverse and the direct and second speed shifter fork retaining pins with a pin punch and hammer.

Pull each shifter lever and shifter fork shaft from the cover with care to prevent losing the detent or interlock balls when the forks are free to drop out of the cover.

Remove the shifter lever lock screws and tap the levers off the shifter fork shafts.

Remove the interlock ball spacer and the detent ball spring from inside the interlock bracket.

Remove the interlock bracket retaining bolt, nut, and washers and lift out the bracket.

Extract the shifter fork shaft seals and seal retainers from the shifter fork shaft holes in the cover.

Speedometer Driving Gear

Remove the driving shaft rear cover and the universal joint flange. Remove the speedometer gear snap ring and slide the gear off the shaft.

NOTE: On the 2126 model loosen and remove the universal joint flange retaining nut and washer, using Socket J-2571A, and pull off the flange, using Puller J-2576.

—Countershaft—Clutch Shaft—Driving Shaft Front Bearing

Drive the countershaft out of the case from the rear using Countershaft Assembly Bar J-2559 and a brass or rawhide hammer. (See figure 1.) This will allow the gear cluster to drop to the bottom of the case when the ends of the tool are flush with the ends of the gear cluster assembly.

Remove the clutch shaft rear bearing cover and pull out the clutch shaft and rear bearing.

NOTE: The clutch shaft *cannot* be removed without

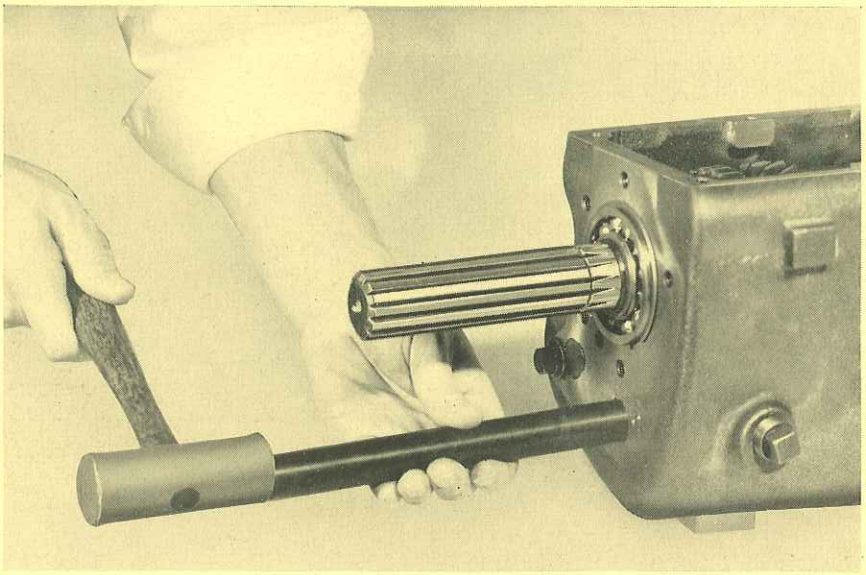

Fig. 1

first removing the countershaft and dropping the gear cluster.

Lift the driving shaft front roller bearing from inside the gear end of the clutch shaft or from the front end of the driving shaft, whichever the case may be. Remove the spacer from the front end of the driving shaft.

Remove the clutch shaft rear bearing snap ring from the clutch shaft using Snap Ring Pliers KMO 410. Place the assembly in an arbor press and press the shaft out of the rear bearing and retaining ring assembly.

Driving Shaft Rear Bearing—Driving Shaft—Gear Cluster

Remove the driving shaft rear bearing snap ring.

With one hand through the opening in the top of the case, support the driving shaft gear and bearing assembly and with the other hand tap the rear end of the driving shaft with a soft hammer (Figure 2) until the driving shaft rear bearing is free and can be removed.

Tilt the front end of the driving shaft upward and lift the shaft and gear assembly out of the case.

thrust washers from the bottom of the case.

Remove the assembly bar, both sets of bearing rollers, the two bearing rings, and the long bearing spacer from inside the gear cluster.

First and Reverse, Second and Direct Speed Clutch Gears—Synchronizer Brake

Slide the low speed sliding gear off the driving shaft and, from the opposite end of the shaft remove the synchronizer, assembly.

Separate the second and direct speed clutch ring from the synchronizer brake and

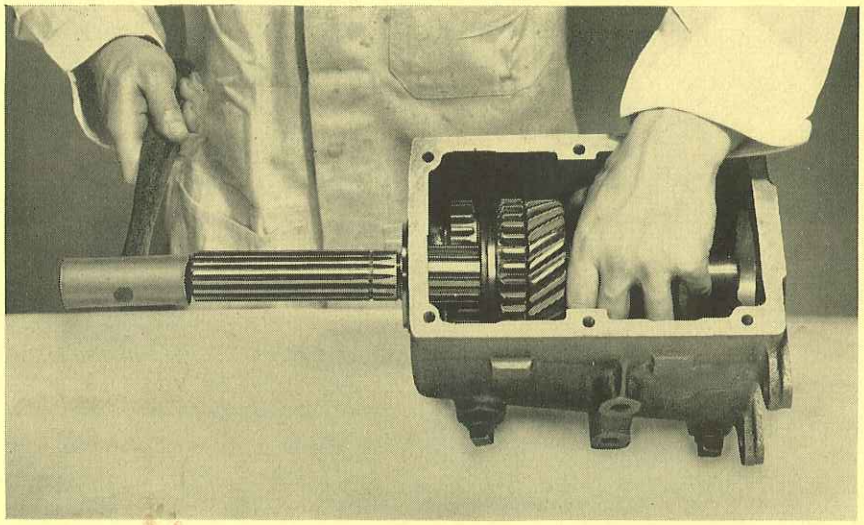

Fig. 2

Remove the countershaft gear cluster, end plates, and clutch gear assembly, pressing them apart by hand.

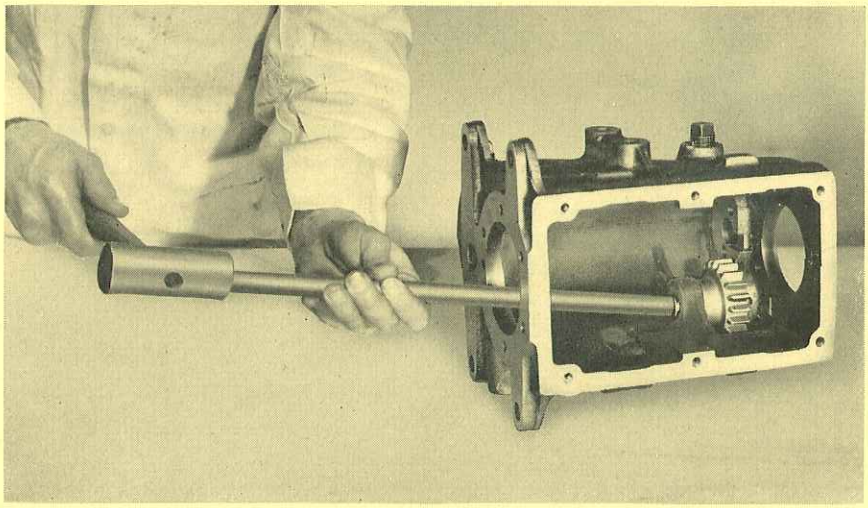

Fig. 3

NOTE: When separating these parts, care should be taken to avoid the loss of any of the detent springs or plungers.

Remove the three brake retainer springs and separate the brake and housing assemblies.

Reversing Pinion—Countershaft Thrust Spring Plugs

Remove the reversing pinion shaft retaining cap screw and washers.

Drive the shaft out of the case from the front using a long drift through the large bearing opening in the front end of the case, as shown in Figure 3, and lift out the pinion.

Remove the two countershaft thrust springs from the inside of the case and, using a small punch, drive out the thrust spring plugs.

INSPECTION

Cover

Inspect the shifter fork shaft holes for wear. If the wear is excessive, it will be necessary to replace the complete cover assembly since the cover alone cannot be replaced.

Check all other parts for wear or defects and replace if necessary.

Gear and Shafts

Examine all gears for chipped or scored teeth.

Check the countershaft and reversing pinion shaft for wear and scores.

Bearings

Inspect all bearings for scores, flat spots, or looseness due to wear.

NOTE

To properly check open type or roller bearings, the bearings should be thoroughly washed in clean kerosene and then blown dry while holding both races firmly to prevent spinning and possible scoring. A very light oil should be applied until all parts are thoroughly coated and the bearing should then be checked for roughness or flat spots.

ASSEMBLY

Cover

Place new shifter fork shaft seals and the seal retainers into the shaft openings in the cover and start the shafts into the openings.

Position the direct drive and second speed shifter fork (the fork with the wide shoes attached) in the forward end of the cover with the hole in the fork in line with the shaft. Push the shaft into place.

Rotate the shaft until the retaining pin holes in the shaft and the fork are in register and drive new retaining pins into the holes.

Install the first and reverse shifter fork in the rear end of the cover following the same procedure as outlined for the direct drive and second speed fork.

Place the interlock ball spacer and the detent ball spring in the interlock bracket. When the bracket is in its normal position the interlock spacer should be toward the center of the cover and the detent ball spring toward the outer edge of the cover.

Place the cover on the bench, top side down, and position the forks so that the center or neutral position grooves of the forks are opposite each other.

While holding the interlock and detent balls in the interlock bracket with one hand, pull the shoe ends of the forks toward each other with the other hand until the balls rest in the center grooves. (See Figure 4.) Continue to pull the forks toward each other, and, at the same time, push the bracket down into position.

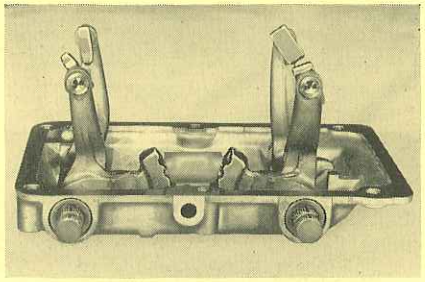

Fig. 4

Install the bracket retaining screw, plain washers, nut, and cotter pin placing the smaller washer under the head of the screw and the larger washer under the nut.

Move the direct and second speed shifter fork to the second speed position and then to the direct speed position and check the clearance between the stops on the fork and the stop pads in the cover. When the ball is properly seated in the detent, in each position, the clearance at the stop should not be less than .002 inch. If the clearance is less than .002 inch, additional clearance may be obtained by filing or scraping the stop pads in the cover.

Install the curved direct and second speed shifter lever on the forward shaft in the cover and the straight first and reverse lever on the rear shaft.

NOTE

Due to the correlated serations in the lever and on the shaft, it is possible to install the lever in four different positions. The levers should point downward when the cover is in its normal position.

Lock the levers in position with the lock screws.

Reversing Pinion

Place the reversing pinion in the case. Position the pinion shaft so that the Woodruff key is in alignment with the recess in the case and tap the shaft into the case far enough to start the pinion on the shaft.

Install the pinion and drive the shaft into the case until the Woodruff key is seated in the recess. Secure with the plain washer, lockwasher, and cap screw.

Gear Cluster

Place the countershaft Assembly Bar J-2559 in the gear cluster and slide the long bearing spacer over the bar to the approximate center of the gear cluster.

Install one bearing ring and 25 bearing rollers in each end of the gear cluster using a heavy grease to hold the rollers in place. (See Figure 5.)

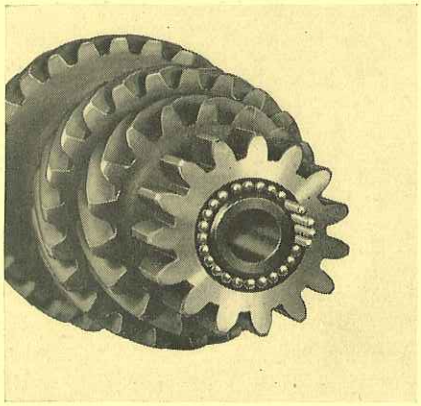

Fig. 5

Add an end plate and then a thrust washer coated with heavy grease to each end of the cluster. Position the thrust washers so the lips of the washers are up and point away from the gear cluster.

Place the entire assembly in the bottom of the case but do not install the countershaft at this time.

Synchronizer Brake—Driving Shaft

Place a synchronizer brake and housing assembly into each end of the direct drive and second speed clutch gear and add the three retainer springs.

Set the assembly on the bench with the extended hub end up and a block under the opposite end and install the synchronizer brake springs and plungers. Hold them in place with Clutch Gear Clamp J-2563.

With the wide shoulder of the external groove facing downward or toward the bench (Figure 6), line up the clutch ring with the clutch gear and press into place.

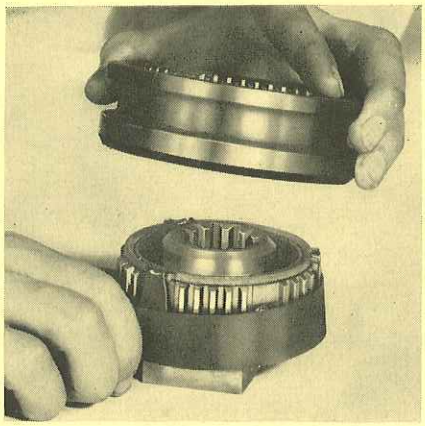

Fig. 6

Slide the assembly onto the main driving shaft so that the wide shoulder of the external groove is toward the second speed gear and install the driving shaft front bearing spacer.

Slide the reverse gear onto the opposite end of the driving shaft with shifting fork groove toward the rear of the case or away from the first speed gear.

Clutch Shaft—Driving Shaft Front Bearing

Press the clutch shaft rear bearing and retaining ring assembly onto the clutch shaft and install the snap ring.

Place the driving shaft front bearing into the gear end of the clutch shaft and slide the bearing spacer onto the front end of the driving shaft.

Place the driving shaft assembly in the case with the long end of the shaft extending through the rear bearing opening.

Slide the driving shaft rear bearing and retaining ring assembly onto the rear end of the driving shaft and, while supporting the front end of the shaft, tap the bearing into place in the case.

Install the clutch shaft assembly while supporting and guiding the front end of the driving shaft into the bearing in the clutch shaft.

Install the clutch shaft rear bearing cover with a new gasket, keeping the drain passage in the cover in line with the drain hole in the case. Add cover retaining cap screws and gaskets.

Install the rear bearing plain washer and the rear bearing snap ring.

Install the speedometer driving gear Woodruff key, gear, and snap ring.

NOTE

The driving shaft rear bearing and the speedometer gear snap rings are available in various thicknesses and should be selected to eliminate end play of the bearing or gear.

Countershaft

Raise the gear cluster into position by inserting drifts or screw drivers through the holes in the case and into each end of the aligning bar. (See Figure 7.)

NOTE

When raising the gear cluster, it may be necessary to

turn the thrust washers to either side to line up the lips of the washers with the machined grooves in the case.

Drive the countershaft into the case while holding and guiding the aligning bar out through the hole in the rear of the case.

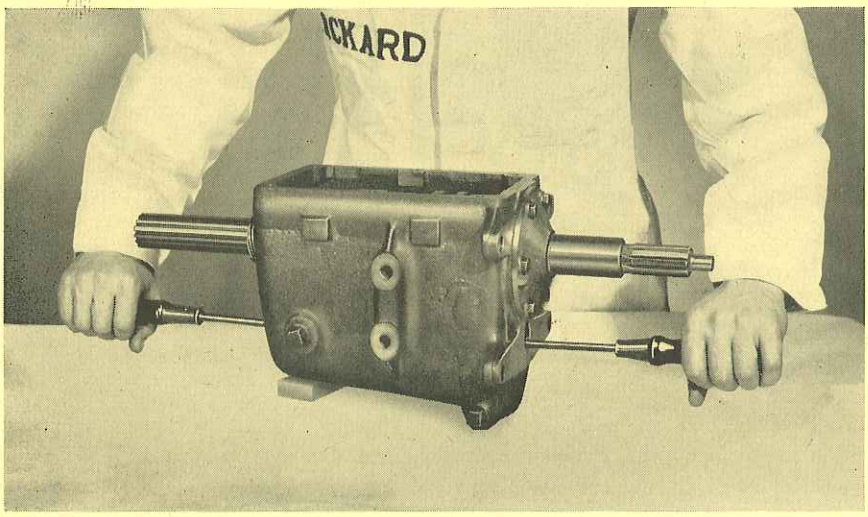

Fig. 7

Support the aligning bar in this position with the drift or screw driver through the hole in the rear of the case.

Start the countershaft through the hole in the front of the case with the Woodruff key aligned with the recess in the case.

Place the two countershaft thrust springs into the openings in the case and install the thrust spring plugs.

Install the driving shaft rear bearing cover with a new gasket and secure with cap screws and lockwashers.

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DRIVEN PLATES AND FRICTION LAG

21st Series

The clutch driven plate assembly, which acts as a connecting link to transmit engine power to the transmission and thence to the driveshaft, rear axle, and finally to the rear wheels, also has another function to perform. This is to absorb and dampen the effect of normal periodic engine torsional vibrations on the transmission where it may cause gear clatter and other noises (transmission jazz.)

As you will note in the illustration, the driven plate assembly consists of a plate to which the facings are attached, a splined hub, two friction washers, and eight drive springs.

The construction of the driven plate assembly is such that the plate does not come in solid contact with the hub at any time, the drive springs being located in slots in the plate and hub so that the drive from the plate is transmitted to the hub through the springs, thus providing a cushioned drive.

The friction washers between the plate and hub are provided to control the action of the drive springs. As seen in the illustration, one washer is placed on each side of the hub. The washers are held against the hub on one side by the clutch plate and on the other by a smaller plate which is riveted to the clutch plate. The tension between these two plates determines the amount of dampening or braking action.

The term "friction lag" is used to describe the degree of dampening or braking action and indicates, in thousandths of an inch, the distance the springs are prevented from returning to the free position after they have been deflected in either direction.

By means of a selection of plates with different amounts of friction lag, the effect of periodic vibrations in different combinations of engines and transmissions may be dampened. For instance, when a car is equipped with an overdrive unit, a high friction lag driven plate is used to dampen the effect of periodic vibration which otherwise would cause the overdrive planetary pinion gears to rattle. This rattle (known as transmission jazz) is evident on acceleration at 22 mph. On the other hand, if a high friction lag plate were installed in a non-overdrive car, the engine would be rough in operation due to the excessive friction between the hub and the clutch plate, preventing the springs from flexing sufficiently to cushion the drive.

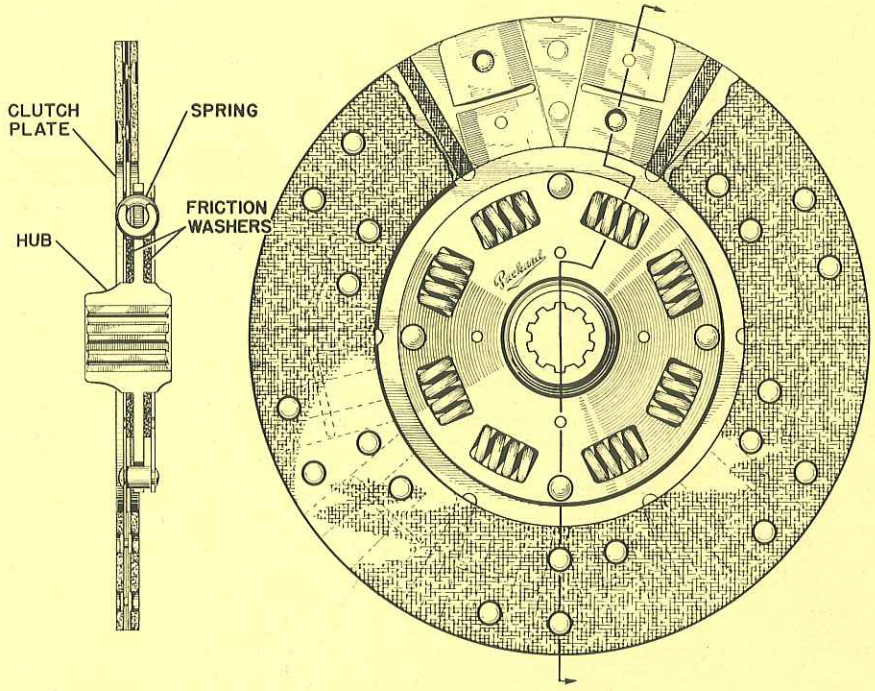
The degree of friction lag in a clutch driven plate assembly is set during the assembly of the plate and is indicated by the color of the paint mark near the hub of the plate. These paint marks should not be confused with the paint on the drive

springs since the color of the springs has no bearing on the friction of a driven plate.

The coil drive springs which provide the cushioned drive between the hub and the clutch plate are not always tight in their slots and some springs may be rotated very easily by hand. This is a normal condition. However, when the driven member is installed and engine power is applied to the plate it moves slightly on the hub, taking up the end play, and the tension of all the springs is uniform. For this reason it is impossible for these springs to rattle and plates should not be replaced simply because the springs are loose when the plate is on the bench.

Recently, the Factory found it necessary to obtain Six, Eight, and Super Eight clutches from alternate sources in order to maintain an adequate supply of these parts. In the April 1, 1947 issue of the Service Counselor under "Special Clutch Data" we listed the various clutch combinations used when engine serial numbers carried no suffix letter and also when the suffix letters "A" or "B" appeared.

Driven plates, in addition to being identified by part number, also may be identified by the color of the painted mark near the hub of the plate, which indicates the friction lag. The accompanying table lists the various identifying colors and the model application for each plate. In cases where the driven plate does not carry an identifying paint mark, the model application may be determined by spline size or plate diameter. We would like to add that where the color blue is specified, the actual color on the plate is more purple than blue.



IDENTIFICATION	CAR EQUIPPED WITH	DRIVEN PLATE	DIA-METER	USE WHEN MOTOR HAS SUFFIX LET.
		2100		
Blue	Std. Trans.	371309	9½″	None or "A"
White	O. D.	354195	9½″	None or "A"
White & Yellow	E. C.	373687	10″	None or "A"
None	Std.–O. D.–E. C.	395922	10″	"B"
		2101-11		
Blue & Yellow	Std. Trans.	373686	10″	None or "A"
White & Yellow	O. D.–E. C.	373687	10″	None or "A"
None	Std.–O. D.–E. C.	395922	10″	"B"
		2103-06-26		
*None	Std.–O. D.–E. C.	351829	11″	None
	("A" combination not used on Super 8)			
White	Std.–O. D.–E. C.	395919	11″	"B"
		2130		
*None	Std. Trans.	356935	11″	None
Blue & Yellow	Std. Trans.	373686	10″	"A"
None	Std. Trans.	395922	10″	"B"

*Model application determined by spline size. Super 8 approx. $\frac{7}{32}$″ larger.

This table is primarily a means for identifying driven plates which are to be installed in cars which require driven plate replacement only.

Two examples of plate identification are as follows:

If the driven plate is a 9½″ plate and the hub is marked with white paint the part number is 354195 (see table) and the plate may be installed in a 2100 overdrive-equipped car which has no engine number suffix or one with the suffix "A".

If the driven plate is a 10″ plate and the hub is marked with white and yellow paint the part number is 373687 (see table) and the plate may be installed either in a 2101 overdrive or Electromatic-equipped car or a 2100 Electromatic-equipped car. In both cases, the engine serial number may have either no suffix letter or the letter "A".

If both the driven plate and the cover plate are to be changed, the "Special Clutch Data" table should be consulted.

NEW TYPE OIL FILTER

Six—Eight—Super Eight

The new type oil filter, now being used in production as standard equipment on Super Eight engines, also will be supplied as an accessory for the Six and Eight. These filters are larger and more efficient than the ones formerly used and a cartridge having an oil-board paper body replaces the metal-bodied cartridge used in the old type filter.

New type filters are identified by the number "P-719" which is stamped in 1/8 inch cut letters on the rim of the filter cover. The old type filter is identified by the silver, rubber-stamped number "PD-5402".

The new type filter and bracket assembly can be installed on cars equipped with the old type filter. This can be accomplished by bending the lower section of the inlet tube in order to reduce the tube length and thereby obtain proper tube alignment. The new type filter cartridges, however, are not inter-changeable with those of the old type and it will be necessary to check the identification number on the filter cover before installing a replacement cartridge.

Oil filter equipment and replacement parts should be ordered under the following part numbers:

Oil Filter Equip.—6 PA378686

Oil Filter Equip.—8 PA378689

Filter and Brackets—
Six, Eight, Super Eight
Replacement for assembly
No. PD-5402—PA378575
Replacement for assembly
No. P-719—PA395488

Cartridge and Gasket Kit—
Six, Eight, Super Eight
Replacement for assembly
No. PD-5402—PA378579
Replacement for assembly
No. P-719—PA395520

Improperly filling out a parts mail order very often results in delaying shipment of the parts ordered. The parts requested should be listed under the Packard part number and not under a vendor's symbol or identification number.

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THE IMPROVED PACKARD SIX ENGINE

21st Series

An improved 21st Series Packard Six engine has gone into production for taxicabs (2130's) and passenger cars (2100's). Engines carrying an engine serial number above F-35000 are of the improved type.

Externally, the new engine differs very little from the earlier 21st Series engine. Internally, however, the changes are much more pronounced. The following paragraphs will describe the various redesigned parts and any changes in the methods of servicing these parts.

CONNECTING RODS

The new rods are heavier than those formerly used and both the crankpin bearing diameters and the bearing lengths have been increased.

The bearing caps are attached with new type "Marsden" self-locking nuts instead of the plain nuts and lock nuts formerly specified.

The only change in the servicing of these parts is in the tightening of the self-locking nuts. The nuts should first be drawn up snugly with a socket wrench and then finally seated with a torque wrench. The specified torque is 55-58 ft.-lb.

CRANKSHAFT AND MAIN BEARINGS

The new crankshaft is a heavier, more rigid shaft with increased main bearing and connecting rod bearing areas.

The bearing caps have been re-designed to carry the larger bearings and the rear main bearing cap now incorporates the braided asbestos oil seal which formerly was used only in the Super Eight engine.

VALVES AND SPRINGS

The intake and the exhaust valves have been increased in size and heavier valve springs are being used.

CYLINDER HEAD

The combustion chambers have been enlarged to provide clearance for the larger valves

and the compression ratio has been increased to 7.0 to 1.

CYLINDER BLOCK

The cylinder block is similar to the earlier block except for a slight increase in length.

The intake and exhaust valve seat diameters have been increased to accomodate the larger valves and the exhaust valve seats are steel inserts.

The intake and exhaust valve guide inside diameters have been increased.

When it is necessary to replace either intake or exhaust valve guides, the finish-reaming operation should be accomplished with a standard $\frac{11}{32}$ inch reamer instead of the special reamers formerly specified. An $\frac{11}{32}$ inch reamer will provide the specified clearance of .002 inch between the intake valve stem and guide and .004 inch between the exhaust valve stem and guide.

OIL PAN

The oil pan has been increased in depth to provide clearance for the new type connecting rods.

CAMSHAFT AND SPROCKET

The camshaft is similar to the one previously used except it is designed to fit the new cylinder block and the camshaft sprocket now is being casehardened.

CRANKCASE VENTILATOR

The crankcase is ventilated by the positive ventilation equipment which formerly was standard in taxicab engines only.

The following Preliminary Parts List may be used when ordering parts for engines carrying engine serial numbers above F-35000.

Part No.	Name	Req.
394491	Engine Assy. (Stripped)	1
389530	Camshaft	1
394395	Camshaft Brg. No. 1	1
316175	Camshaft Brg. No. 2	1
315012	Camshaft Brg. No. 3	1
394397	Camshaft Brg. No. 4	1
389647	Conn. Rod & Bushing Assy.	6
394398	Conn. Rod Bearing Assy. (Std.)	6
394401	Conn. Rod Bearing Assy. (.001 undersize)	6
394404	Conn. Rod Bearing Assy. (.002 undersize)	6
394407	Conn. Rod Bearing Assy. (.020 undersize)	6
389531	Crankshaft	1
387608	Crankshaft Bearing Assy. No. 1 (Std.)	1
387609	Crankshaft Bearing Assy. No. 1 (.001 undersize)	1
387610	Crankshaft Bearing Assy. No. 1 (.002 undersize)	1
387611	Crankshaft Bearing Assy. No. 1 (.020 undersize)	1
394436	Crankshaft Bearing Assy. No. 2 & 3 (Std.)	2
394437	Crankshaft Bearing Assy. No. 2 & 3 (.001 undersize)	2
394438	Crankshaft Bearing Assy. No. 2 & 3 (.002 undersize)	2
394439	Crankshaft Bearing Assy. No. 2 & 3 (0.20 undersize)	2
387632	Crankshaft Bearing Assy. No. 4 (Std.)	1
387633	Crankshaft Bearing Assy. No. 4 (.001 undersize)	1
387634	Crankshaft Bearing Assy. No. 4 (.002 undersize)	1
387635	Crankshaft Bearing Assy. No. 4 (.020 undersize)	1
348578	Piston Assy. (Std.)	6
348579	Piston Assy. (.005 oversize)	6
348581	Piston Assy. (.020 oversize)	6
348582	Piston Assy. (.030 oversize)	6
348583	Piston Assy. (.040 oversize)	6
394070	Pistons, Rings, Pins, & Bushings Kit (.020 oversize)	1
394071	Pistons, Rings, Pins, & Bushings Kit (.030 oversize)	1
394072	Pistons, Rings, Pins, & Bushings Kit (.040 oversize)	1
324283	Piston Pin (Std.)	6
324673	Piston Pin (.003 oversize)	6
324674	Piston Pin (.006 oversize)	6
354716	Ring Set (Std.)	1
354717	Ring Set (.020 oversize)	1
382886	Ring Set (.030 oversize)	1
382887	Ring Set (.040 oversize)	1
333583	Expander Set	1
362010	Crankshaft Rear Bearing Oil Seal	2
394385	Cylinder & Piston Assy.	1
395490	Cylinder Head	1
395567	Cylinder Head Gasket (Std.)	1
394464	Cylinder Head Gasket (Extra Thick)	1
395611	Valves—Exhaust	6
395934	Valves—Intake	6
351750	Valve Spring	12
364391	Valve Guide—Exhaust	6
348607	Valve Guide—Intake	6
395666	Valve Tappet Assy. (Std.)	12
395667	Valve Tappet Assy. (.001 oversize)	12
395668	Valve Tappet Assy. (.002 oversize)	12

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