PACKARD SERVICE LETTER

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WHAT TO DO ABOUT DETONATION

Packard engines that are in new condition as regards carbon formation will operate without audible detonation ping on regular grade gasoline of good quality. Any high compression engine, however, will detonate when it has accumulated a certain amount of carbon and the same engine with all carbon removed will detonate if the fuel used is below a certain anti-knock value. Regular grade ethylized fuels have an octane number of 68 to 70, premium grade ethylized fuels have a minimum rating of 76 and may go as high as 80.

The amount of carbon that can be tolerated is about the same for all engines of equal compression pressure. The higher the pressure, the smaller the permissible amount of carbon. From the fuel standpoint, a difference in anti-knock rating of only 2 octane numbers may mean the difference between very loud ping and no ping at all. A majority of owner complaints are definitely traceable to the use of fuels of inadequate anti-knock ability.

If the effects of carbon were confined to an increase in the mechanical compression ratio, detonation could always be cured by changing to a fuel of higher octane number. The higher compression pressure thus achieved would improve fuel economy. Unfortunately, carbon deposits retard the transfer of heat and may eventually induce pre-ignition which reduces power and may cause serious damage. An engine may be so badly carbonized that premium fuel will not damp out the detonation.

It is evident then that efficient handling of detonation complaints must involve a consideration of the variation in fuels, amount of carbon and degree of deviation from standard adjustments. A good diagnostician will quickly detect the controlling factor and apply the necessary correction. For those less proficient, it is advisable to follow an orderly process of elimination.

The procedure should be one that will inflict the minimum amount of owner inconvenience and expense. He should not, for instance, be expected to carry out fuel tests for the education of the shop personnel. Similarly, a desirable procedure should be simple to execute, inexpensive and accurate enough to disclose the source of trouble in at least a majority of the complaints. It is our belief that the following paragraphs represent a fair compromise of the factors just discussed.

On all detonation complaints, drive the car and make at least a mental note describing the degree of severity. The lowest speed that a given hill or grade can be climbed before detonation occurs provides a fair yardstick.

Next, set the ignition timing to standard, check for and correct weak or broken governor advance springs and spark plugs that are too hot or of such length that their shells extend into the combustion chamber. Make sure that manifold heat valve is operating properly. If a subsequent road test over the same hill shows that ping has not been reduced to a satisfactory level, the next step should be to determine the quality of the fuel being used.

This can be done by substituting a regular grade fuel that is *known* to have good anti-knock qualities. A quick method is to use the gas mileage tester with the hose connected to

a one gallon supply of the master fuel. If the ensuing hill test shows that car has normal power but detonation is still objectionable, you should recommend the use of premium grade fuel or, run another test using premium fuel so as to double check the diagnosis.

It should be noted that we referred to "normal" power. If the engine is "flat" from leanness, the use of premium grade fuel will help only slightly because lean mixtures greatly increase the detonating tendency. The obvious step at this phase of the procedure is to correct the "lean" condition. This will include setting the carburetor fuel level to standard height, checking jet sizes, eliminating air leaks and making sure that accelerating pump delivers standard quantity per 10 strokes.

If the next hill test shows that premium grade fuel has eliminated the ping, you may then be confronted with the job of selling the owner on its use. This should not be difficult since we know definitely that the detonating tendency of Packard engines is no worse than others and better than most. The owner should also be told that several thousand additional miles of knockless operation with standard power may be expected.

Should the owner *decline* to use premium fuel or if premium fuel *fails* to eliminate detonation, the only remaining remedy is to decarbonize the engine. This may be done by burning with oxygen or by removal of the cylinder head. On a so-called chronic case we recommend head removal because only with the head off can you check the items listed in the next paragraph.

Before installing the cylinder head, relieve all sharp edges. Renew any burned or feather edged exhaust valve. Investigate any piston that shows heat marks at center of head. Install an additional or a thicker gasket under any spark plug that projects into combustion chamber or secure proper plugs. Check the head and block for water jacket obstructions or insulating deposits on the jacket walls. Reject any head gasket that overlaps the head chamber edges or the cylinder bore circle. If the engine is not "pumping oil" these corrections should eliminate detonation for many thousands of miles.

1937 SHOP MANUAL CORRECTION

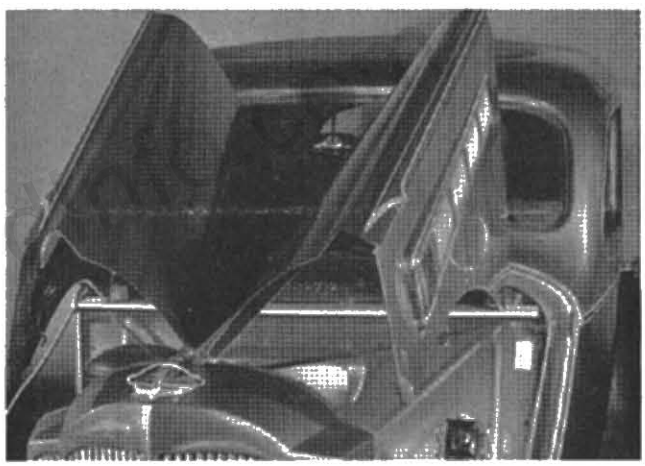
In the current edition of the 1937 Packard Shop Manual now being distributed a correction should be made on page 37, paragraph 5. The tappet setting is given as .004" inlet and .006" exhaust. These figures should be changed to read tappet setting .006" inlet and .008" exhaust, engine warm and idling.

HOOD HOLDING BOARD

You probably have noticed on some of the newer cars that the hook supplied on the inner edge of the hood has been omitted, and for many service jobs it is much more convenient to have a wide open hood.

We have just received a suggestion from Mr. Bailey of Westfield, New Jersey, which has been forwarded to us by Mr. George Kloetzer, General Service Manager in New York, for a very handy arrangement which accomplishes the holding open of the hood.

Out of a piece of box board they cut a strip 40½" long and 3" wide with an approximate thickness of ⅜". When the hood is raised the board is placed crosswise on the radiator tie rods at the rear next to the body. Placing between the body edges eliminates the possibility of the board slipping endwise.



You will find that both sides of the hood can be raised and kept securely in the raised position. This gives plenty of clearance to work and is particularly handy when installing accessories such as heaters, radios, and in other service work.

ELECTRICAL EQUIPMENT— ORDERING PARTS

Supplementary pages have been issued for the Service Parts List which will enable you to find detailed parts on both Delco-Remy and Auto-Lite electrical units for the Six, 1500-1-2 and 1506-7-8. The 120-C has been equipped only with Auto-Lite units.

There is no fixed breaking off point in production which will indicate when the Delco-Remy units were discontinued and the Auto-Lite substituted on the other series.

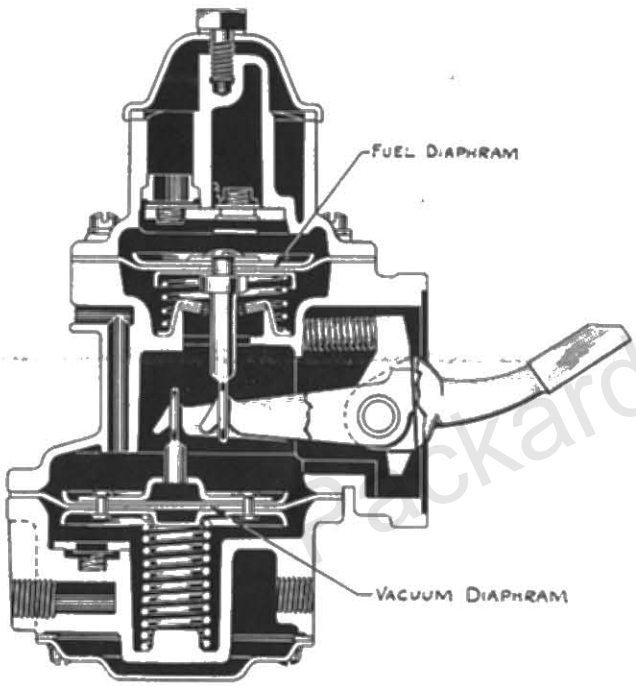
In ordering repair parts it will therefore be necessary to first determine the make of equipment on the car and then select the part wanted from the proper group in the parts list.

OIL CONSUMPTION

In spite of previous warnings in the Service Letter (Vol. 10, No. 15) we are still hearing of owners sold new piston ring installations to cure over-oiling when the vacuum booster pump was at fault.

As you know, one side of the vacuum booster pump diaphragm is open to the crankcase. With one side of the diaphragm open to the crankcase and the other side exposed to the manifold vacuum, even a minute opening in the diaphragm will allow crankcase vapor and oil spray to be drawn through into the intake manifold and so on into the combustion chamber.

This source of oil loss may be difficult to locate as it is particularly heavy at high engine speeds when the crankcase vapor is heavy, and may be negligible or non-existent at low speeds. The vaporized oil being thoroughly mixed with the incoming charge to the cylinders burns completely and is not indicated by dirty or fouled plugs or smoking exhaust (except in particular and extreme cases).



In cases of excessive oil consumption the vacuum booster pump should be removed, disassembled and the diaphragm inspected for leaks before any other work is done on the engine.

With the vacuum booster working properly the windshield wipers will operate under heavy load full throttle conditions, such as on a heavy pull. Slowing up or stopping of the wipers under these conditions may be an indication of a leaking diaphragm.

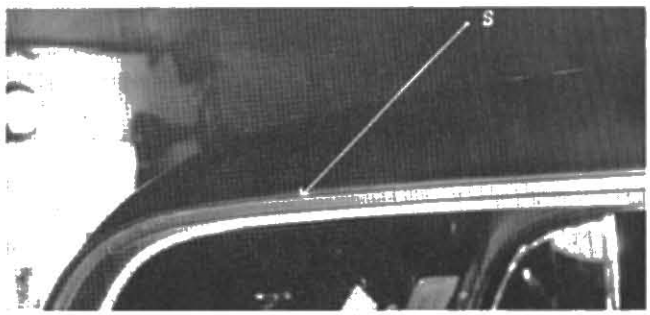
Vacuum booster diaphragm failure is more prevalent on the 120 and 120-B since hot oil from the crankcase lies on the diaphragm because of its position at the bottom of the pump. You may however have diaphragm failure on the 120-C and Six. It is recommended that the diaphragm be renewed every 25,000 miles, and when doing this it is also recommended that the fuel pump diaphragm be renewed.

No 120 or Six engine should be opened up for over-oiling until after the vacuum booster pump diaphragm has been renewed and the car has again been checked for oil consumption.

WATER LEAKS—SIX and 120-C

Water leaking at the windshield corners and at the top of the rear quarter may not be entering through the windshield or through a leak in the top.

The roof rail is covered with a two-piece metal cover with an overlapping joint under the drip moulding. Water entering here at "S" will fill the header and run down the front door pillar and out at the lower corners of the windshield or it may run back toward the rear where it soaks through the trim near the top.



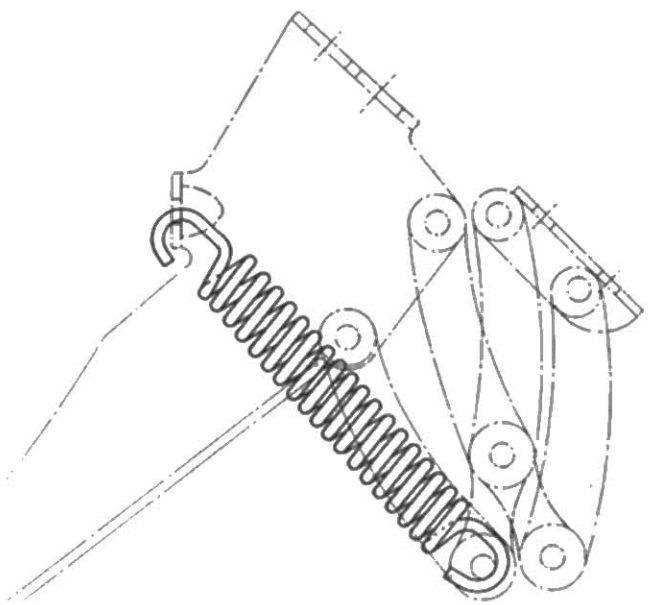
To seal a leak at "S" it is not necessary to remove the section. Seal the opening with a good top sealer all along both sides and a permanent cure will be effected.

A leak at the top corner of the top will also give the impression of a leaking windshield by allowing water to run down the front door pillar and out near the lower windshield corner.

REAR COMP. LID HINGE SPRING

Six and 120-C Rumble Seat Coupe

These springs must be installed correctly or failure will result. If the springs are installed with the opening in the eye up, opening the lid will throw the contact on the outer end of the eye greatly increasing the load. Repeated opening of the lid will cause the spring to break at the eye.



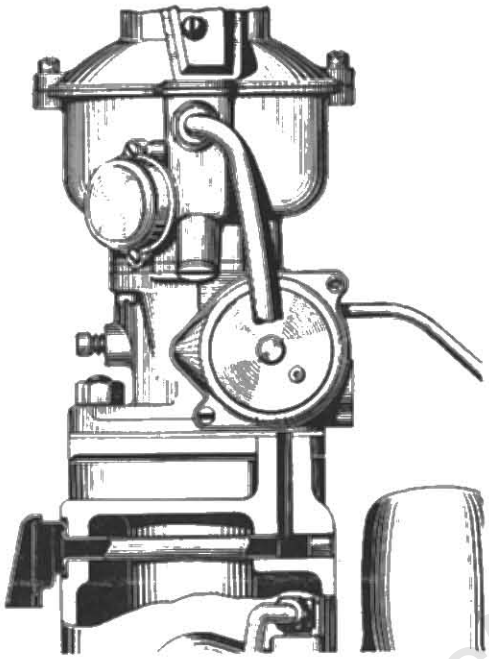
When the springs are installed with the opening facing down, as illustrated, the contact is kept in close to the shank of the eye, the load is much reduced and no trouble will be experienced.

AUTOMATIC CHOKE—SIX

Failure of the automatic choke on the Six to come off the fast idle cam, or a slow action of the choke causing overchoking during the warm-up period may be caused by rust in the automatic choke chamber.

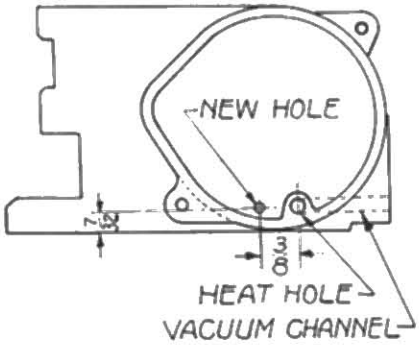
Rust formed by condensation accumulates on the fast idle cam cross shaft and binds it so that the light return spring cannot turn it off the fast idle position. Rust forming on the floating lever retards its free action and interferes with the free action of the choke.

This condensation may be caused by exhaust gases leaking into the automatic choke heater tube in the manifold hot spot.



When moisture and rust are found in the automatic choke chamber, examine the heat hole in the carburetor body. Moisture or carbon deposits on the walls will indicate an exhaust leak and the tube must be made tight in the manifold. In some localities, due to conditions of temperature and humidity, condensation forms in the automatic choke chamber even though there is no exhaust leak.

This condition is not general, but in localities where it is found it can be corrected by providing a drain hole as shown in the illustration.



Drill a No. 60 drill size hole $\frac{3}{8}$" to the left of the heat hole and $\frac{1}{32}$" up from the flange. Drill through from the automatic choke chamber to the vacuum channel. This will permit moisture and condensation to be drawn off, and thus prevent rusting.

TIGHTENING CYLINDER HEAD NUTS

Pulling cylinder head nuts up too tight, or tightening them unevenly, may be the cause of excessive oil consumption, low gasoline mileage, generally poor performance, and cracked cylinder heads.

The tension of the cylinder head studs on the block tend to pull it out of shape. If the cylinder head nuts are pulled too tight or are tightened unevenly, the studs will pull the cylinder bores out of round so that the rings cannot seat properly and excessive oil consumption, loss of compression and generally poor performance will follow. If the cylinder head nuts are not tightened in the proper order or are tightened unevenly, the cylinder head cannot expand uniformly when hot and it may crack.

We have had reports from the field of cases where engines have become oil pumpers immediately after a carbon and valve job, of cases where the installation of new rings failed to correct over-oiling, for no other reason than that some cylinder head nuts were tightened too tightly, and others not tight enough. Cylinder heads which have given 10,000 to 15,000 miles of satisfactory service and then crack after having been removed and replaced during some service operation are not defective, but have been broken through improper tightening.

Aluminum cylinder heads should be tightened cold, cast iron heads hot. In all cases, however, the cylinder head nuts must be tightened evenly.

Go over all the nuts twice. The first time draw them up snug, but not tight. The second time over, pull them all down uniformly tight.

Tension Indicating Wrench S.T. 999, $17.50; S.T. 2001 Extension, $1.15; is designed for this operation.

The pull required to turn the nut is shown on the dial and by tightening each nut until the same figure is indicated you are assured of uniform tightening. The cylinder head nuts on all four lines of cars, Six—120—Super Eight—Twelve, should be tightened to a uniform tension between 150 and 170 as shown on the dial. (670 to 760 inch pounds.) This will be found sufficiently tight to insure against leaking or blown out gaskets and with uniform tension the distortion of the cylinder block will be negligible.

In using the wrench, it will be found that an initial high reading of the force required to start the unit will be shown, followed by a second reading of the force required to turn it.

The second is the true reading. Do not use short jerky strokes on the wrench. Use a long, slow stroke and stop when the desired tension shows on the dial.

It is recommended that cylinder head gaskets be coated with "Perfect Seal" (See Service Letter Insert April. 15, 1936) or some other good gasket paste when installing. If this is done, it will not be found necessary to pull one or two nuts down tighter than the rest to stop a water leak.

If the studs are also coated with "Perfect Seal" it will prevent sticking and will facilitate removal.

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