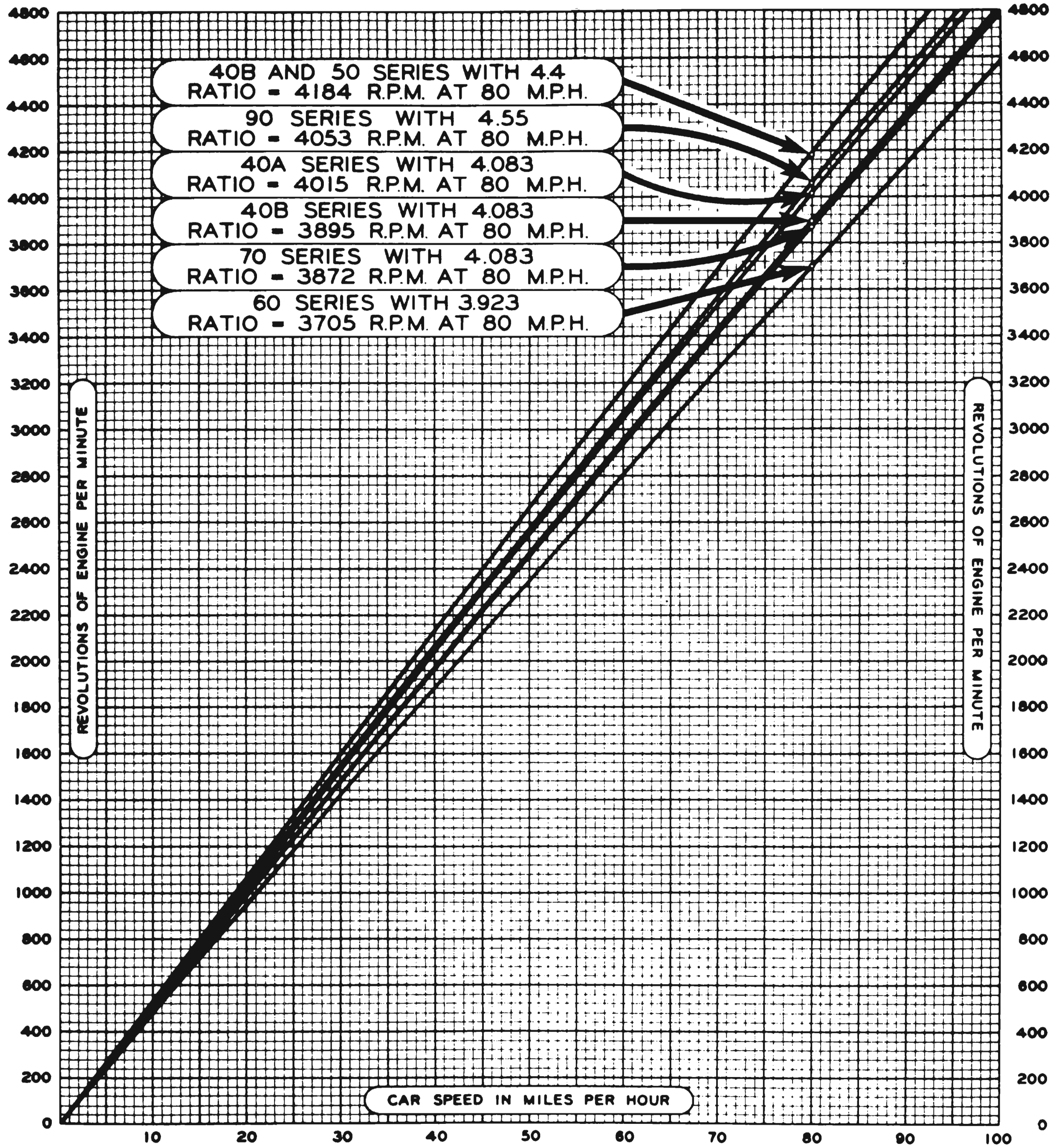
ENGINE



	SERIES					
	40A	40B	50	60	70	90
WHEELBASE	118	121	124	126	129	139
AXLE RATIO - STANDARD	4.083	4.4	4.4	3.923	4.083	4.55
OPTIONAL	-	4.083	-	-	-	-
TIRE SIZE	15 X 6.50	16 X 6.50	16 X 6.50	15 X 7.00	15 X 7.00	16 X 7.50
TIRE PRESSURE - REAR	25	25	25	25	25	25
REVS PER MILE AT 50 M.P.H.	745.7	722.7	724.9	717.4	717.4	677.8

Fig. 6-1. Chart Showing Relation Between Engine Revolutions and Car Speeds

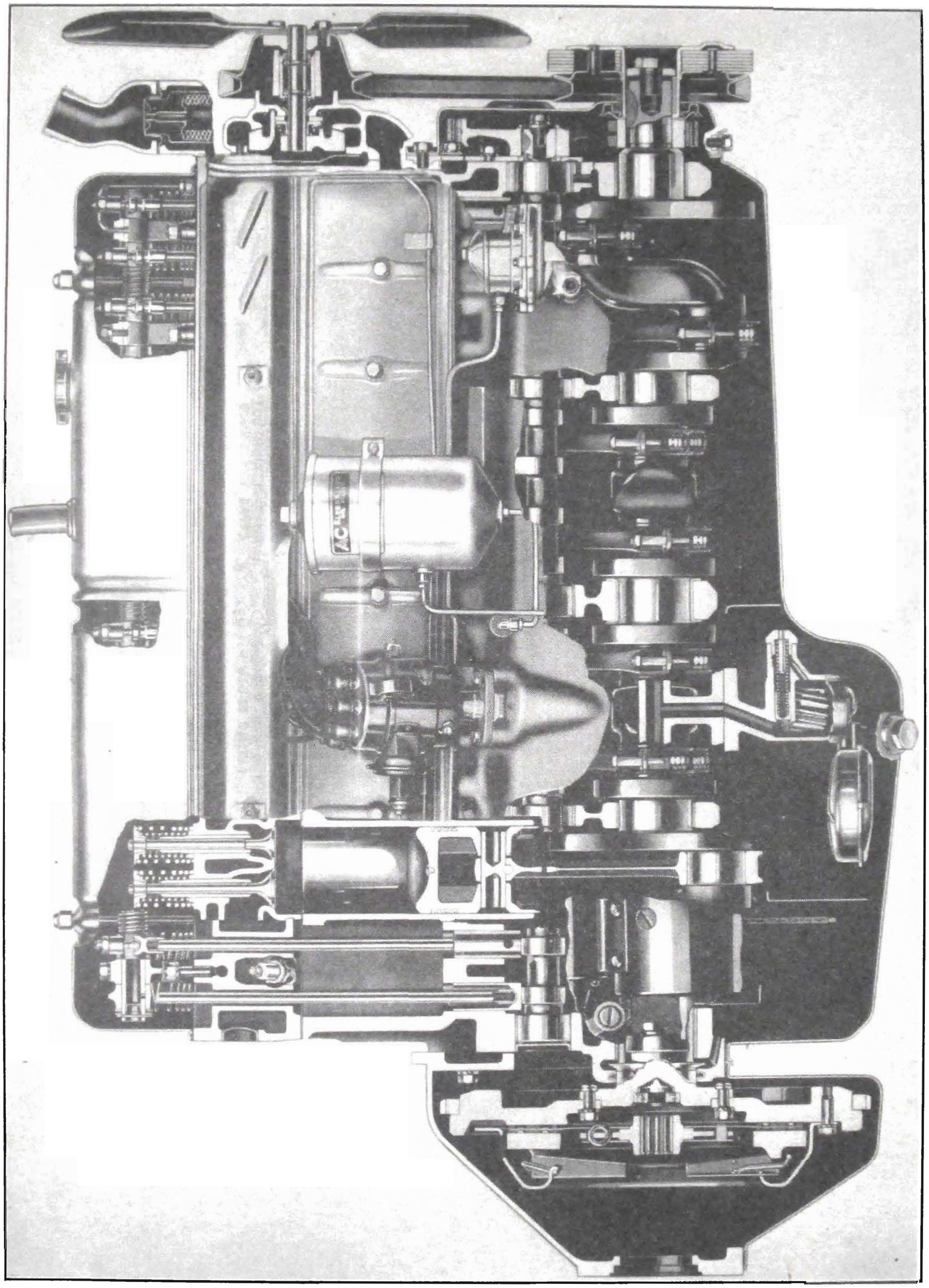


Fig. 6-2. Engine Side Sectional View—Series 40-50

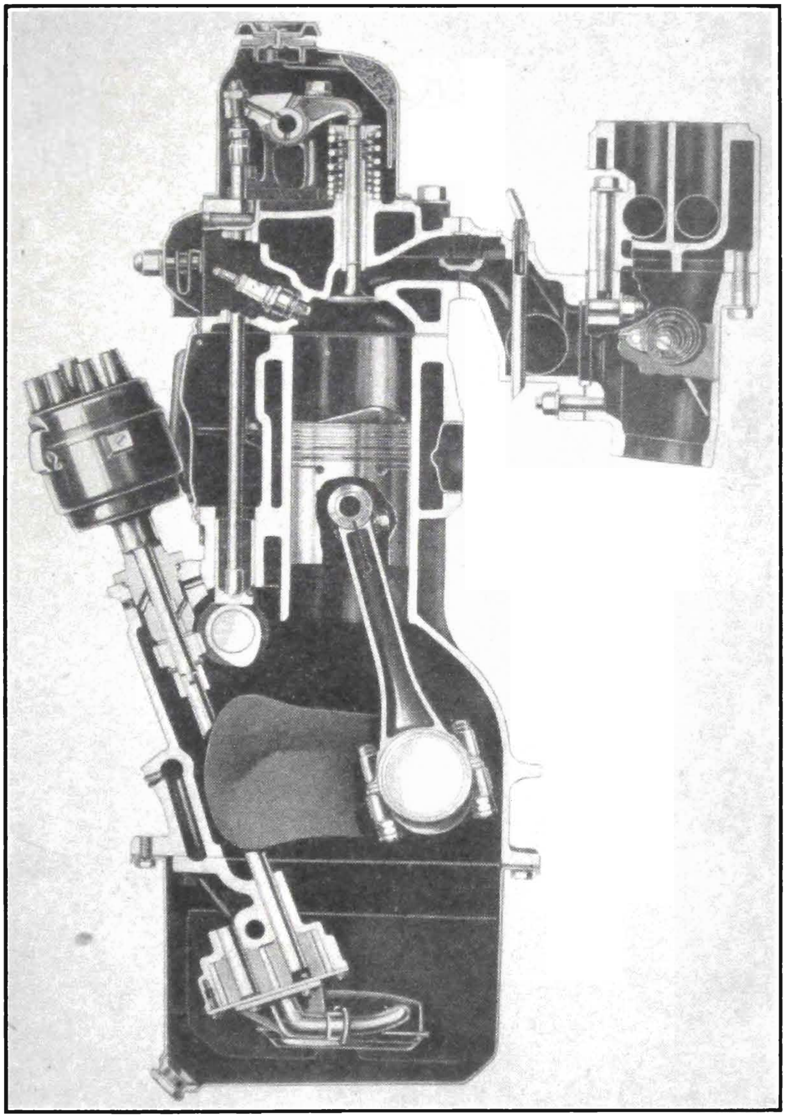


Fig. 6-3. Engine End Sectional View—Series 40

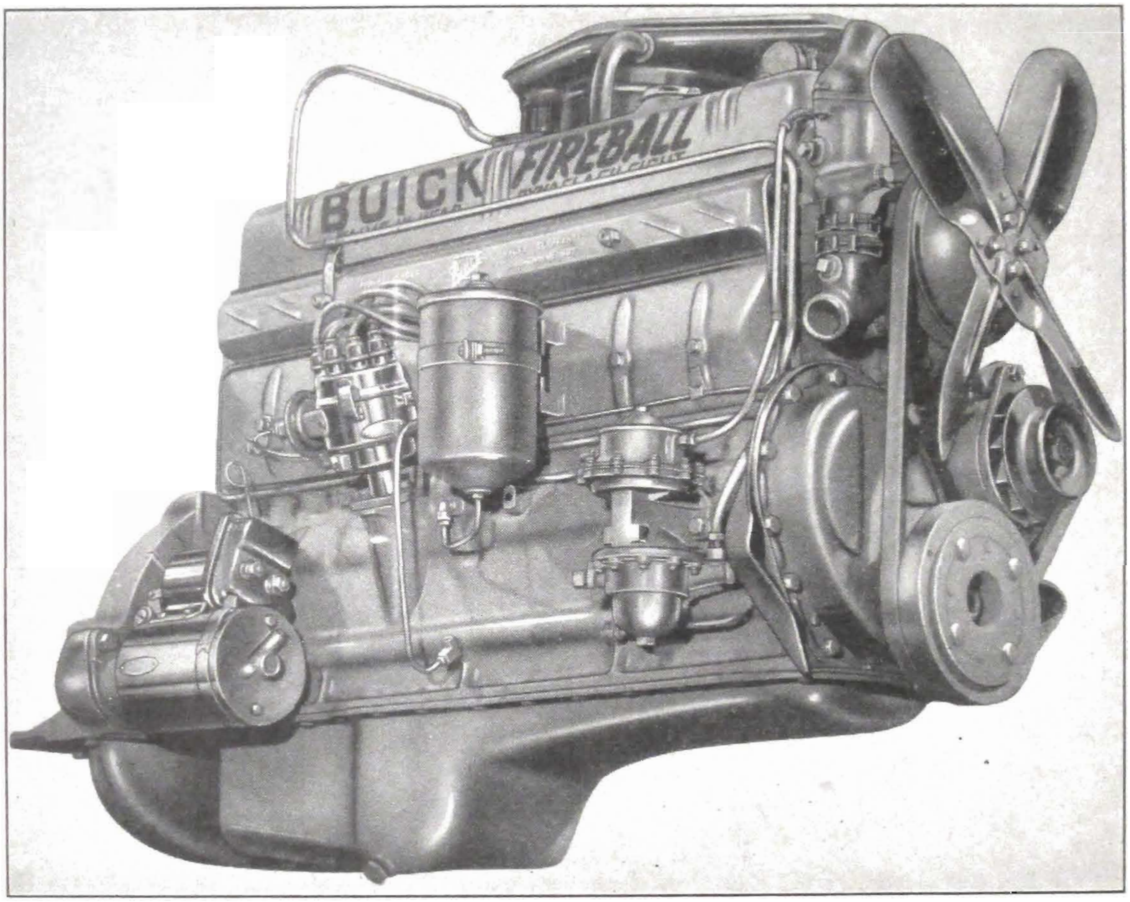


Fig. 6-4. Engine, Right Side—Series 60-70-90

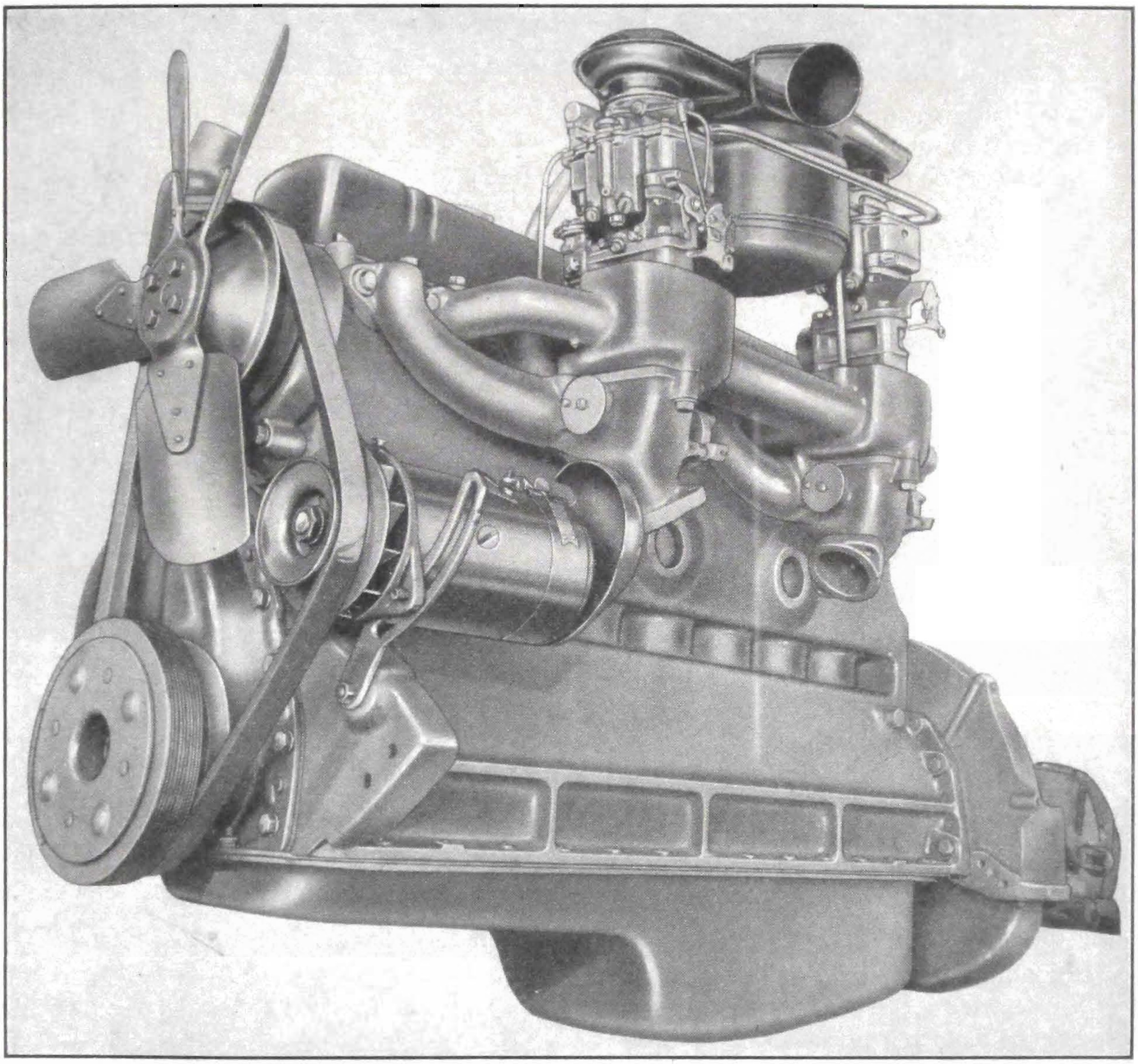


Fig. 6-5. Engine, Left Side—Series 60-70-90

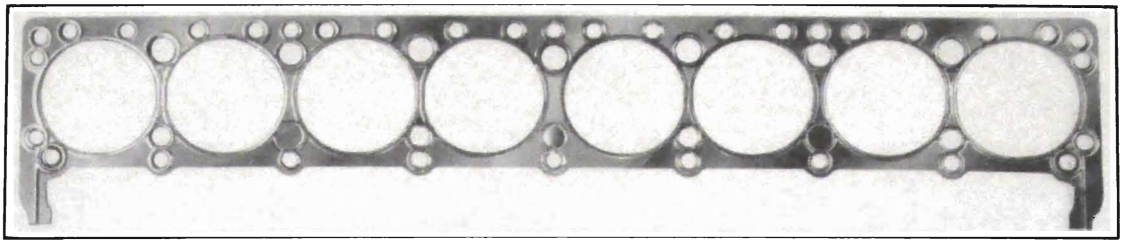


Fig. 6-6. Cylinder Head Steel Gasket

CYLINDER HEADS AND GASKETS

Holes in block for all cylinder head bolts located under rocker arm cover and all rocker arm shaft bracket bolt holes in head are blind tapped except the two short studs used at the foot of the two end rocker arm brackets. These are tapered studs threaded to insure tight fit in cylinder head.

During carbon scraping operations it will be necessary to prevent filling blind-tapped cylinder block holes with carbon. Foreign matter in holes will prevent proper tightening of bolts and also cause undue strain on the cylinder block.

Cylinder heads are all the same size on Series 40-50 and on the Series 60-70-90.

Two types of cylinder head gaskets are used, a crimped steel gasket for high compression compound carburetor equipped engines, and a steelbestos gasket for low compression single carburetor equipped engines. **Steel gaskets are coated with a lacquer when made and are not to be coated with any type of gasket oil or sealer in service.** See Fig. 6-6.

Sealing is assisted by crimping the gasket during manufacture. Cylinder heads must therefore be tightened evenly and bolts tightened according to sequence shown in Fig. 6-7.

Due to gradual tightening against crimped sections the tightening sequence should be repeated after all bolts have been tightened once.

After an engine has been run sufficiently long to bring all parts to normal operating temperature a final tightening should be made by using one hand on a 9″ wrench, or preferably a tension wrench as described below. Excessive tightening of the cylinder head may distort cylinder bores and may cause excessive oil consumption. Special bolt and nut tension recording wrenches are available. The dial reading for proper tension on Buick heads is the equivalent of 65 to 70 foot pounds. **This type of wrench should always be used when installing cylinder heads.**

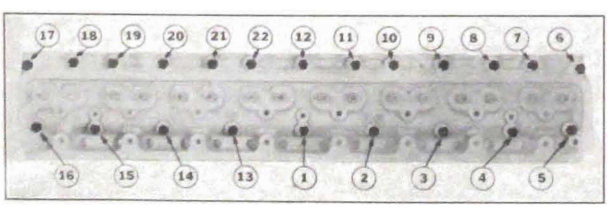


Fig. 6-7. Tighten Bolts in Order Shown

When cylinder heads are removed, the gasket surface of head and block must be cleaned of any lacquer that might have accumulated from old gasket.

A new gasket must always be used because crimping of used gasket has been flattened.

Cylinder head gaskets used in the Series 40 engines equipped with single carburetor are Steelbestos and .070″ thick. Compound carburetion equipped Series 40 engines use crimped steel gasket and are .015″ thick.

CRANKSHAFT

The five main bearing journals are stepped up in size from front to rear.

The crankshaft and torsion balancer are balanced separately both statically and dynamically, making both replaceable as separate units.

TORSION BALANCERS

The crankshaft torsion balancer consists of a small flywheel supported on four pins and eight spring banks. Laminated steel discs riveted together form the flywheel portion of the balancer. Fan drive pulley is riveted to balancer.

TIMING CHAIN COVER

Timing chain cover is a pressed steel stamping heavily ribbed for strength. A spring loaded synthetic rubber seal is assembled into the crankshaft opening to prevent oil leaking around the hub of torsion balancer. See Fig. 6-8.

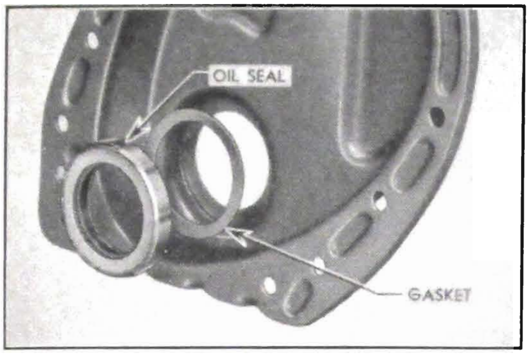


Fig. 6-8. Timing Chain Cover Oil Seal and Gasket

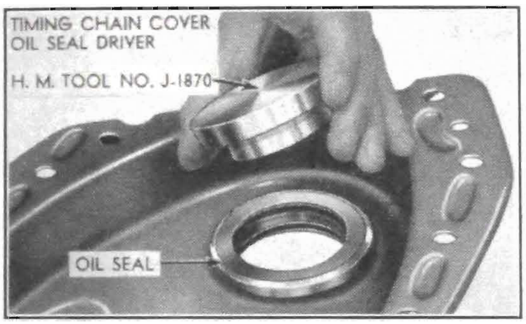


Fig. 6-8A. Installing Oil Seal

The seal assembly is pressed into a pocket in the cover and is serviced separate from the cover and should be assembled with the small diameter of the seal or the side of the seal assembly with the garter spring toward the rear of cover.

When installing timing chain cover, it is important that it be carefully centered.

MAIN BEARINGS

All bearing shells are assembled with from .000" to .002" projection above the bearing cap and face on crankcase to insure positive contact.

Shims are provided to allow adjustment for wear. Main bearing caps should not be filed.

Main bearings are supplied in service in reamed sets. **These must only be used in complete sets.** These matched sets are produced by line reaming a set of bearings in a crankcase. Therefore when mixing with another line reamed set, misalignment of crankshaft is very likely to occur.

Main bearings are also supplied in service which are not reamed to size. These require special reaming equipment to fit.

Rear Main Bearing Oil Seal Installation
All Series

Oil seals at rear main bearings are provided as follows:

1. Cork gaskets at the vertical joint between bearing cap and crankcase.
2. A groove in the bearing ahead of the oil collecting groove, drains into crankcase, relieving the oil collecting groove of surplus oil.
3. Special packing ring gasket around the crankshaft.

The rear main bearing packing should be cut $\frac{3}{64}$" above face of bearing to insure a tight fit when assembled.

It is important that engine be operated slowly when first started after new packing is assembled in bearing.

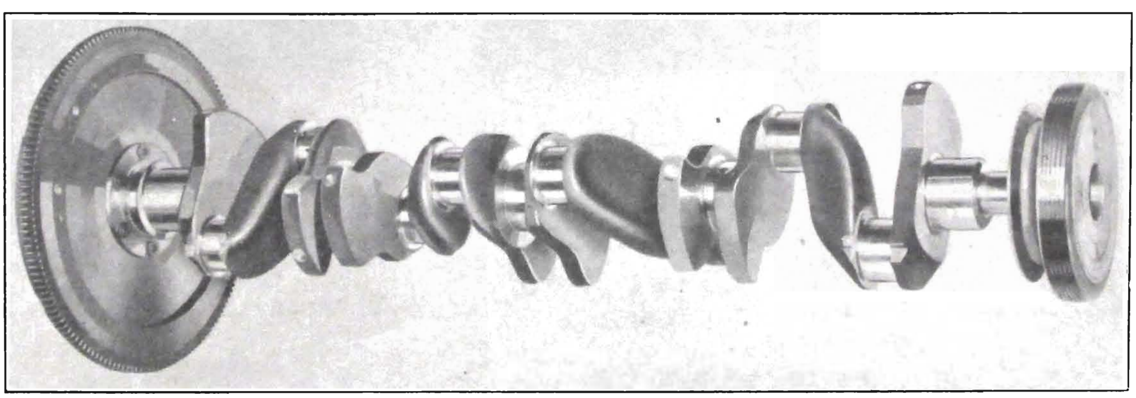


Fig. 6-9. Crankshaft and Flywheel Assembly

PISTONS

- ***Series 40-50—Cast-Iron***
- ***Series 60-70-90—Alloy***
- Pistons are "full skirted" and cam ground.
- Piston head is hollowed out to improve combustion. The hollowed side of piston head is toward spark plug or camshaft side of engine. See Fig. 6-10.

Fig. 6-10. Piston

- **In no case should pistons be fitted tighter than the limits specified.** See Piston Fitting Chart, page 6-9.

Pistons can only be removed through the TOP of the block.

The piston pin is locked in the upper end of the connecting rod and floats in the piston. Two broached grooves on side of piston pin bearings provide piston pin lubrication.

Pistons are assembled on connecting rods with the oil spray hole in connecting rod toward the hollowed side of piston head. Rods must be assembled to crankshaft with oil spray hole facing the camshaft. See Fig. 6-18.

- Pistons should be carefully wiped off before installing, and should be dipped in a light oil such as 10-W before inserting in the bores.

PISTON FITS

Check for Fits

Sometimes pistons are needlessly replaced because of noise complaints when actually the original pistons were right size for best performance, quietness, and general operation.

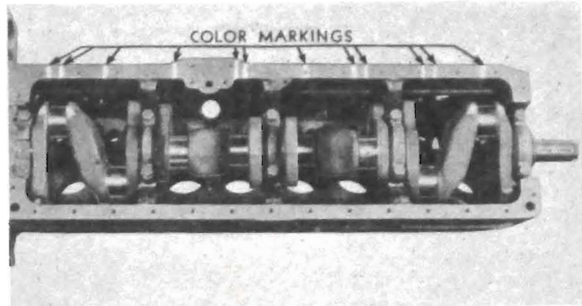


Fig. 6-11. Crankcase Color Marking

Before replacing a set of pistons on a production engine, refer to chart which gives bore sizes and piston sizes according to color markings. See Piston Fitting Chart, page 6-9. Observing color markings on crankcase and referring to chart will furnish exact cylinder bore measurement. See Fig. 6-11. Observing color markings on pistons will furnish exact piston measurements. See Fig. 6-12. These marks indicate factory measurements and will be found to be correct. **It is not necessary to remove pistons to make this check** as all paint marks are visible when oil pan is removed.

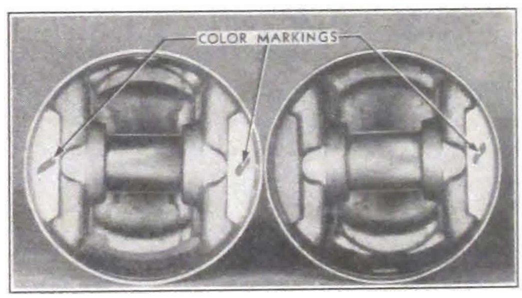


Fig. 6-12. Piston Color Marking

Using Color Markings

Service pistons and pins are available only as an assembly. This insures proper piston pin fits and obviates the need for fitting the pins at the standard temperature in the field. Pistons must always be ordered by part number. See Piston Fitting Chart, page 6-9.

Using Feeler Gauges

Fits of the pistons may be checked by using ribbon feelers ½" wide, the piston to hold of its own weight on a ribbon of maximum thickness, and to pass of its own weight on a ribbon of minimum thickness.

	Series 40-50	Series 60-70-90
Pass on	.0015″ ribbon	.002″
Hold on	.00225″ ribbon	.00275″

If feeler gauges are used to measure piston fits they should be at least 12″ long and approximately ½″ wide.

When pistons are fitted to cylinder bores, they should be at the same temperature as the cylinder block. This is important because a difference of 10° is sufficient to produce a variation of .0005″. Fits should be made after pistons and crankcase have been subjected to a room temperature of 65° to 75° F. for a period of time to permit their attaining a common temperature.

To correctly fit pistons, proceed as follows: Wipe the cylinder walls and pistons with a clean

(Continued on page 6-10)

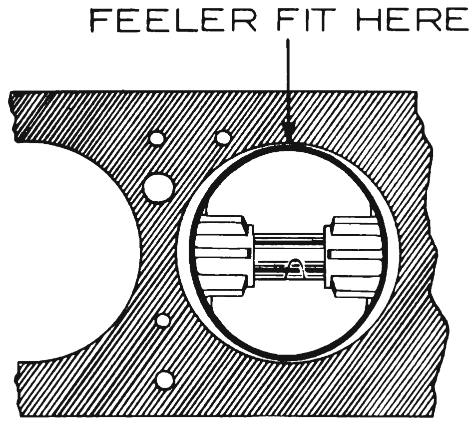


Fig. 6-13. Fitting Pistons with Feeler Gauge

PISTON FITTING CHART

SERIES 40-50 PRODUCTION CAST-IRON PISTONS (3$\frac{3}{32}$″ DIAMETER)

Cylinder and Piston Marking	• • Yellow	• Yellow	• Yellow	• • Yellow	• Green	• • Green
Piston Diameter	3.0887 - 3.0890	3.0890 - 3.0893	3.0893 - 3.0896	3.0896 - 3.0899	3.0899 - 3.0902	3.0902 - 3.0905
Cylinder Bore Diameter	3.0907 - 3.0910	3.0910 - 3.0913	3.0913 - 3.0916	3.0916 - 3.0919	3.0919 - 3.0922	3.0922 - 3.0925
Cylinder and Piston Marking	• White	• • White	• Red	• • Red	• Blue	• • Blue
Piston Diameter	3.0905 - 3.0908	3.0908 - 3.0911	3.0911 - 3.0914	3.0914 - 3.0917	3.0917 - 3.0920	3.0920 - 3.0923
Cylinder Bore Diameter	3.0925 - 3.0928	3.0928 - 3.0931	3.0931 - 3.0934	3.0934 - 3.0937	3.0937 - 3.0940	3.0940 - 3.0943

SERIES 40-50 SERVICE CAST-IRON PISTONS (3$\frac{3}{32}$″ DIAM.) MASTER PARTS LIST GROUP 0.629

Piston and Pin Assembly	#1393260	#1393261	#1393262	#1393263	#1393264	#1393265
Nominal Size	Standard Size	.005″ Oversize	.010″ Oversize	.015″ Oversize	.020″ Oversize	.030″ Oversize
Piston Diameter	3.0914 - 3.0923	3.0955 - 3.0961	3.1005 - 3.1011	3.1055 - 3.1061	3.1105 - 3.1111	3.1205 - 3.1211

Cast-iron pistons should be fitted to Series 40-50 engines with a clearance of from .0017″ to .0023″. When using feeler gauges for fitting, piston should pass on .0015″ and hold on .00225″ feeler ½″ wide.

Do not attempt to use cast-iron pistons mixed with aluminum in same engine; all must be either aluminum or cast-iron. If the engine had aluminum pistons, new rods for cast-iron pistons must be installed with the cast-iron pistons. Also if engine had aluminum or alloy pistons and cast-iron pistons are installed, spark timing must be changed. See Ignition Timing.

SERIES 60-70-90 PRODUCTION ALLOY PISTON (3$\frac{7}{16}$″ DIAMETER)

Cylinder and Piston Marking	• • Yellow	• Yellow	• Yellow	• • Yellow	• Green	• • Green
Piston Diameter	3.4328 - 3.4331	3.4331 - 3.4334	3.4334 - 3.4337	3.4337 - 3.4340	3.4340 - 3.4343	3.4343 - 3.4346
Cylinder Bore Diameter	3.4357 - 3.4360	3.4360 - 3.4363	3.4363 - 3.4366	3.4366 - 3.4369	3.4369 - 3.4372	3.4372 - 3.4375
Cylinder and Piston Marking	• White	• • White	• Red	• • Red	• Blue	• • Blue
Piston Diameter	3.4346 - 3.4349	3.4349 - 3.4352	3.4352 - 3.4355	3.4355 - 3.4358	3.4358 - 3.4361	3.4361 - 3.4364
Cylinder Bore Diameter	3.4375 - 3.4378	3.4378 - 3.4381	3.4381 - 3.4384	3.4384 - 3.4387	3.4387 - 3.4390	3.4390 - 3.4393

SERIES 60-70-90 SERVICE PISTONS (3$\frac{7}{16}$″ DIAMETER) MASTER PARTS LIST GROUP 0.629

Piston and Pin Assembly	#1393207	#1393218	#1393219	#1393220	#1393221	#1393222
Nominal Size	Standard Size	.005″ Oversize	.010″ Oversize	.015″ Oversize	.020″ Oversize	.030″ Oversize
Piston Diameter	3.4352 - 3.4364	3.4408 - 3.4414	3.4458 - 3.4464	3.4508 - 3.4514	3.4558 - 3.4564	3.4648 - 3.4664

Aluminum alloy pistons should be fitted to Series 60-70-90 engines with a clearance of .0026″ to .0032″. When using feeler gauges for fitting, piston should pass on .002″ and hold on .0275″ feeler ½″ wide.

Piston diameter is determined by measuring the major diameter which is at top of the skirt and at right angles to the axis of the wrist pin hole. Pistons should not be colder than 70° F. when measured.

Cylinder bore size should be measured by using inside micrometers, or telescope gauge and outside micrometer, or an inside indicating gauge, measuring the smallest diameter between the top and center of the bore at an angle of 90° with the axis of the crankshaft.

All production cylinder bores are paint marked for size opposite the cylinders. Marks extend from underneath the oil pan gasket.

cloth. Suspend feeler gauge down the cylinder bore along the wall as indicated, holding upper end with the right hand. See that the gauge extends for entire length of bore. Now grasp the piston by means of piston pin with the first two fingers and thumb of the left hand. Insert inverted piston down the bore with feeler gauge on one side of piston and wrist pin parallel to the centerline of crankshaft.

The piston should move downward the length of the bore of its own weight when tried with a thin feeler. After this fit has been determined a check should be made, using a thick feeler, but should fit closely enough to prevent its moving downward under its weight alone. With care exercised in this procedure very good fits should result.

Using Micrometers

Buick pistons should be fitted at a temperature of 70° F. The clearances at this temperature are:

	Limits	Desired
Series 40-50	.0017" to .0023"	.0020"
Series 60-70-90	.0026" to .0032"	.0029"

The piston skirt provides clearance throughout the temperature range when fitted at the above temperatures. It is normal to find the piston clearance at the top of the skirt slightly greater than at bottom after initial running of the engine.

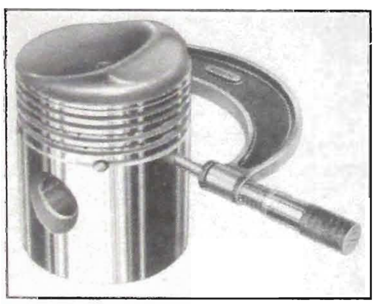


Fig. 6-14. Measuring Piston with Micrometer

Service pistons may be fitted to the cylinder barrels by micrometer check, using the following procedure:

The pistons should be set, skirt down, on a bench and the diameter checked as shown. See Fig. 6-14. The micrometers must be set with just sufficient pressure to give a "*feel.*"

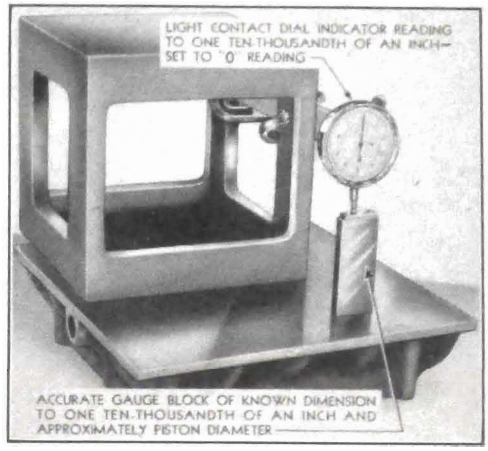


Fig. 6-15. Dial Indicator and Block

If a dail gauge is available it may be set up as shown. See Figs. 6-15 and 6-16. In this case the inside micrometers may be checked in the same set-up and fewer errors introduced in the procedure.

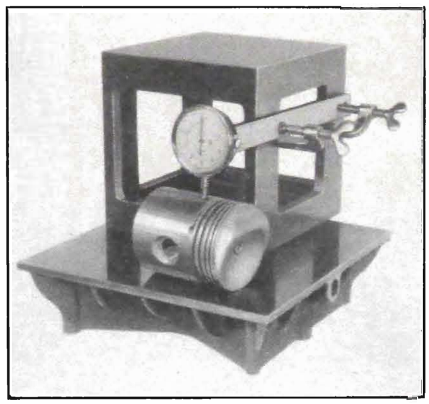


Fig. 6-16. Dial Indicator and Piston

The barrel sizes should preferably be measured with an inside indicating gauge. However, inside micrometers or some form of telescope gauge and outside micrometers may be successfully used if proper care is taken to insure accurate readings.

The gauge used to measure the barrels should be checked against the gauge used to measure the piston to insure accuracy of the final piston fit.

The barrel size used for determining piston clearance should be the smallest diameter between the top and center of the bore at an angle of 90° with the axis of the crankshaft.

Pistons—Ordering for Service

When pistons are ordered from the factory or from a parts warehouse, it is not practical to supply pistons selected as to color markings. Therefore, pistons should be ordered by part number only. Pistons in a production engine may vary, as indicated on the chart.

When standard production size pistons are ordered all pistons shipped will be high limit pistons. For this reason .001″ oversize will not be furnished because these are same as high limit pistons furnished when regular production pistons are ordered.

PISTON RINGS

Four ring grooves are provided in the head of the piston.

The top groove of piston carries a special design $\frac{3}{32}$″ compression ring.

The side of ring, which has groove cut at inner diameter, is to be installed toward top of piston.

The second ring groove of piston carries a $\frac{3}{32}$″ compression ring. The side of this ring which is to be installed toward top of piston is marked "TOP."

These rings are machined so that when assembled the cylinder wall face will have a slight taper and only the lower edge contacts the cylinder wall. This edge wears into a good contact with the cylinder wall quickly and results in a compression seal as well as assisting in oil control because of its scraping action while wearing in.

The two lower grooves on all series are fitted with $\frac{3}{16}$″ oil control rings of the channeled high unit pressure type. Both oil rings are alike and may be installed with either side toward top of piston. Each oil ring is provided with eight oil return slots.

Piston Ring Fits

Compression rings are fitted with a side clearance of .0015″ to .0035″, and a gap clearance of .010″ to .020″.

Both oil control rings are fitted to side clearance of .0015″ to .003″, and a gap clearance of .010″ to .020″.

A special ring remover and replacer will be necessary for servicing rings. KMO-297-E for Series 40-50; KMO-297-D for Series 60-70-90. See Fig. 6-17.

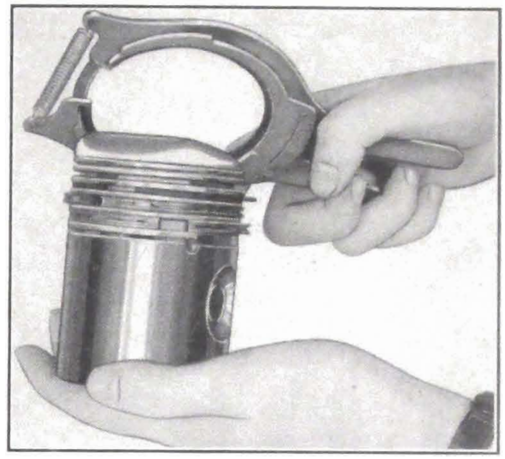


Fig. 6-17. Piston Ring Remover

Service Piston Rings

Service piston rings are furnished in oversizes of .010″, .020″ and .030″. For pistons .005″ to .010″ oversize use rings .010″ oversize, and for pistons .011″ to .020″ oversize use rings .020″ oversize. For pistons .021″ to .030″ oversize use rings .030″ oversize. In all cases carefully file the ends of the rings so that they have a minimum end clearance of .010″ when tried in the cylinder barrel in which they are to be used.

Rings should be fitted to the limits given under "Compression Rings" and "Oil Control Rings." Oversizes ordered should be determined by the measurement of smallest portion of the bore to be serviced.

PISTON PINS

Piston pins are fitted with a clearance of .0003″ to .0004″ at approximately 70° F. This is equivalent to an easy finger push at that temperature.

All service pistons are diamond bored at the pin holes and are fitted with pins.

When piston pins are found to be "too tight" or "too loose" new piston and pin assemblies should be installed. Slight tightness on new pistons or new engines will correct itself as mileage builds up.

Sometimes pins will be found tight due to varnish or other accumulation from lubricants. Removing this accumulation will usually correct the fit. Pistons which have been scored, even though the score is slight, may have tight pins due to the two piston pin bosses being pulled out of alignment with each other.

CONNECTING RODS

Connecting rods are heat-treated drop-forged steel with I-beam section. The lower end bearing is babbitt lined, bonded directly to the steel of rod and cap. This babbitt has the characteristic of becoming dark in color with use. Shims are provided to allow adjustment without filing.

Rods are forged with sufficient boss on upper end and on bearing cap so that both ends of rods can be balanced to correct weight during manufacture.

When assembling connecting rods, care must be taken to insure that the sides of the cap and rod line up to prevent scoring of the thrust faces on the crankshaft cheeks. When assembling in the engine, connecting rod should have the marker on the rod and the cap pointing toward rear of engine.

Special diameter ground bolts are used to insure an accurate line-up of the cap and rod on assembly. Under no circumstances should common bolts be used, or it will not be possible to obtain proper fits or be assured of necessary strength.

A new connecting rod has been developed for the Series 40-50 engine using cast-iron pistons. The rods are shot blasted and can be identified by the part No. 1393255. These rods may be used singly or in sets for replacement in engines using connecting rod part No. 1393024.

But first type rod, part No. 1393024, must not be used in engines with cast-iron pistons.

Replacement Connecting Rods

If new connecting rods are required for servicing engines, always obtain and use a new Buick factory-produced rod. Rods rebabbited at any other source are not recommended.

Reducing the diameter of crank pins by resizing, necessitating a thicker wall of babbitt, is not recommended, as thicker babbitt will materially reduce the life of connecting rod bearings.

These recommendations include all past models.

Care must be taken when assembling the connecting rod and piston that the piston pin clamp bolt is properly tightened.

In adjusting connecting rod bearings, the only method to be used is the removal of shims which are provided for this purpose.

CAMSHAFT

Camshaft is supported in the crankcase in steel-backed babbitt bushings and driven from the crankshaft by a silent chain.

Camshaft Bearings

Slightly scored bearings will be satisfactory if the surface of both camshaft and bearing is polished off and fit is free but within specified limits for fit when camshaft is installed.

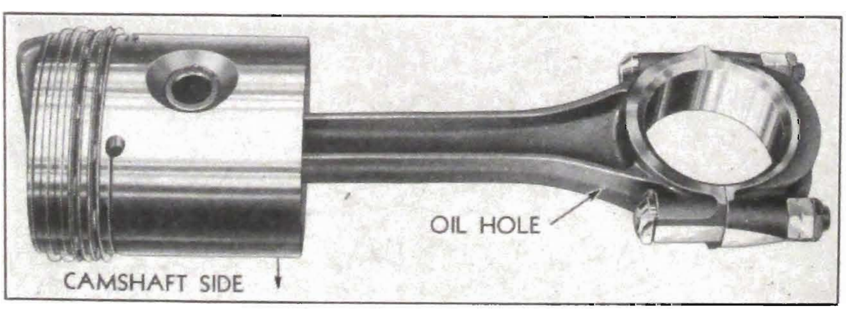


Fig. 6-18. Connecting Rod and Piston

Special reaming equipment is required to fit bearings after they are pressed in place. For this reason original bearings should be retained unless severely damaged.

VALVES

Streamlined intake valves are used in all series. Exhaust valves are of conventional design and made of special heat-resisting steel. See Fig. 6-19.

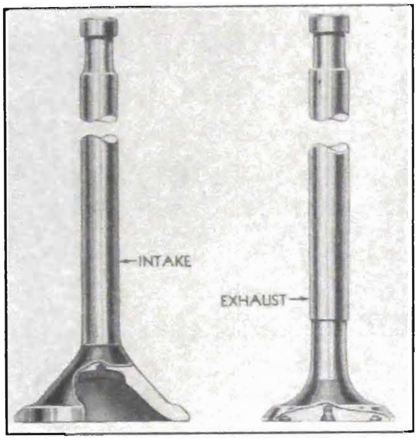


Fig. 6-19. Valves—Sectional

Valve Reseating and Refacing

Valve seats in cylinder heads, and on valve faces, should never be cut away excessively while using valve re-seating equipment. Only enough stock should be removed to true up the face surfaces.

After truing, if the seats are over 5/64" wide, they should be narrowed up with the proper 20° and 70° cutters. The nominal seat width is .062".

Cutting away the seats results in lowering valve spring pressure. This will cause valve noise, valve sticking, and less cooling at the seats. The head of the valve will run hotter as its thickness is decreased or sharp edges formed at the outer diameter.

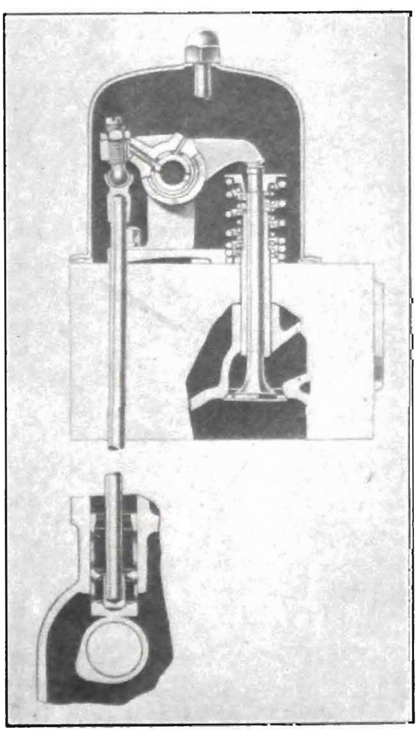


Fig. 6-20. Valve Operating Mechanism

VALVE SPRINGS

Two springs are used on each valve. See Fig. 6-20.

PUSH RODS

Valve push rods are made of steel tubing for lightness and strength. Tubing is 3/8" outside diameter with wall 1/32" thick.

ROCKER ARMS

Malleable hardened rocker arms are used on all series. The rocker arms do not use a bushing where rocker arm operates on the rocker shaft.

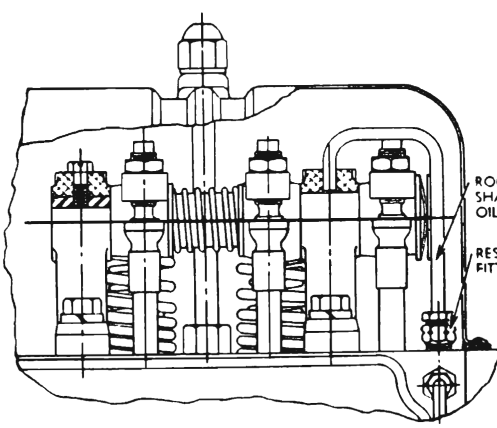


Fig. 6-21. Rocker Arm Shaft Bracket Construction

ROCKER ARM SHAFTS

Shafts are one-piece tubing case-hardened and ground. Shaft outside diameter, 13/16"; wall thickness, 5/32"—all series.

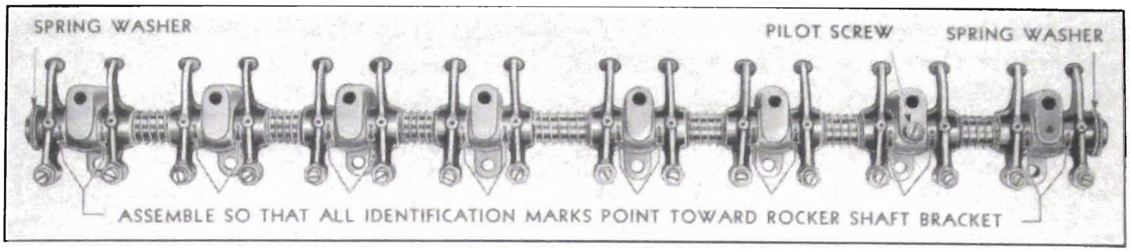


Fig. 6-22. Rocker Arm Shaft Assembly—Series 40-50

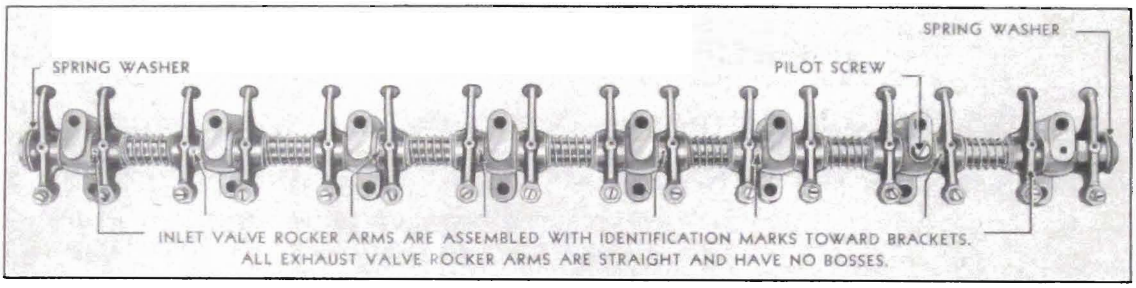


Fig. 6-23. Rocker Arm Shaft Assembly—Series 60-70-90

VALVE LIFTERS

Valve lifters are single piece with hardened and ground contact face.

Lifters are carried in guide holes reamed in the crankcase. See Fig. 6-20.

VALVE LASH

When an engine is warmed by running without load in the shop, the water and oil temperatures will level off but at different temperatures from those obtained by stabilizing with car on the road and therefore require a different value for the valve lash.

For maximum engine performance it is imperative the ROAD OPERATING VALVE LASH BE .015". To lash valves in the shop and obtain a .015" road operating lash, the following procedure must be carefully followed:

Standard Shop Lash Procedure

1. Raise or remove hood and loosen radiator cap. (This will prevent excessive water temperature build up under some conditions.)
2. Run engine on floor at fast idle (minimum 700 R.P.M.). Too low a speed will not provide proper water circulation through the engine. Allow engine to run for a minimum of 20 min. and a maximum of 30 min. This will stabilize the water and oil temperatures for lash purposes.
3. If car has been on the road recently and engine oil is warm when starting engine for valve lash warm-up, use a .017" feeler gauge and check with an .018" feeler as a "No Go" gauge. If engine (particularly oil) was cold (shop temperature) when warm-up was started, use an .018" feeler gauge and check with a .019" "No Go" gauge.

CAUTION: **Cars which have stood outside in cold weather for some time should be warmed up for a minimum of 30 min.** and lashed using an .018" feeler gauge and a .019" "No Go" gauge.

Cars coming in from a hard run should be allowed to stand in shop with switch off for about an hour before warming for shop lash. This is because oil is at operating temperatures and will not cool sufficiently while engine is idled to use shop lash procedure.

VALVE TIMING

The timing chain and sprockets are set in such relation to one another that the position of the pistons and valves is correctly timed when the marks on the cam sprocket and the crank sprocket are in line with copper plated steel washers on the chain. These copper plated washers are ten links apart. *This setting must be adhered to strictly.* See Fig. 6-27.

Figures given in engine specification section give the timing when valves are .004″ off their seats after being set to .015″ lash. The point when the valves are .004″ off their seats, shown on the chart as the timing point, is considered to be the beginning or end of their effective opening. The interval between the opening and closing points and the timing points represents that portion of the cam where the rate of lift is slow. which permits some variation in lash without causing noisy valve action. See Figs. 6-24, 6-25.

The following procedure may be followed to determine if the camshaft is set for correct valve timing.

Place an indicator on the exhaust valve spring cap for either #2 or #7 cylinder so that it will accurately measure the valve opening. See that the valve being checked is lashed .015″. Set the indicator so that it will register "0" with the valve closed. When the crankshaft has been turned in the direction of rotation so that the valve opens .145″ for the Series 40-50 and .155″ for the Series 60-70-90, the #1 and #8 T.D.C. mark on the flywheel should then be visible through the timing inspection hole in the flywheel housing. See Fig. 6-26.

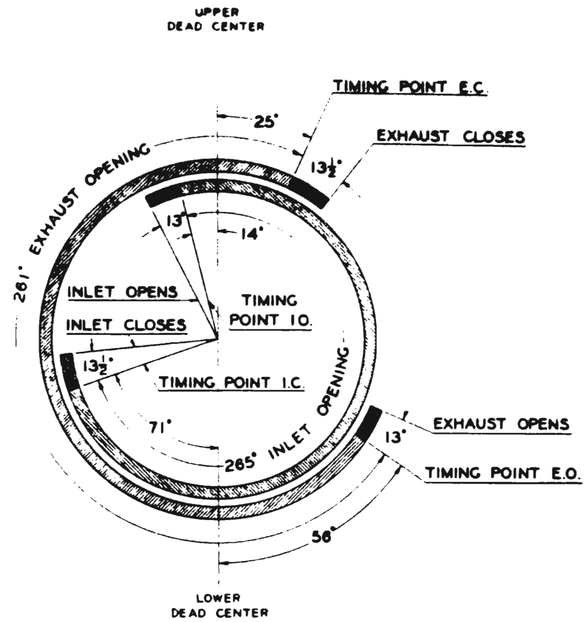


Fig. 6-25. Valve Timing Chart—Series 60-70-90

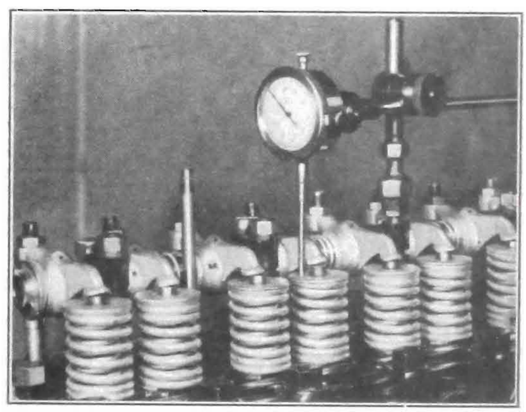


Fig. 6-26. Checking Valve Timing with Indicator on No. 2 or No. 7 Cylinder

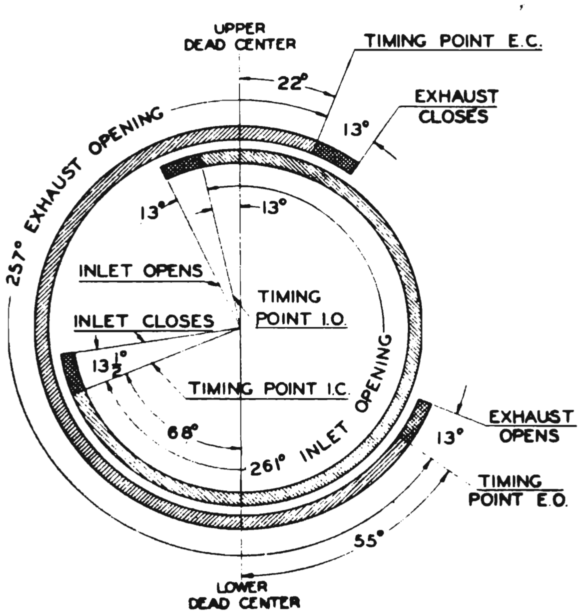


Fig. 6-24. Valve Timing Chart—Series 40-50

CAMSHAFT RUN-OUT CHECK

The following procedure may be used to determine if the cam run-out on camshaft is beyond limits which may cause missing on one or two cylinders and usually one or more valves will be noisy unless lashed to less than .015" clearance. This check should be made in engines which have failed to respond to the regular tune-up, and which show evidence of faulty cams.

1. Remove rocker arm cover, spark plugs and lower flywheel housing.
2. If No. 1 exhaust cam is to be checked, rotate flywheel until No. 8 exhaust valve is wide open. No. 1 exhaust tappet will then be on center of cam heel.
3. Make a chalk mark on flywheel at edge of flywheel housing on each side. (See Fig. 6-26A.)

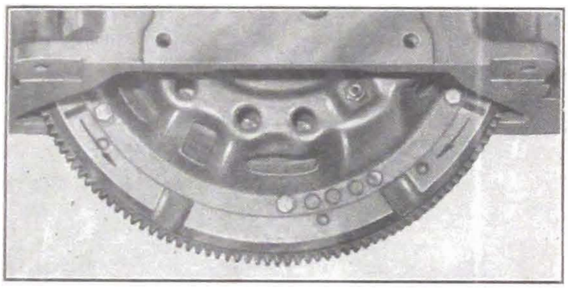


Fig. 6-26A. Marking Flywheel

4. Indicator may be mounted on special stud which can be made up in any shop. This stud is to be screwed into place after removing the top or long rocker arm bracket cap screw. Any standard dial indicator may be used and set up on No. 1 exhaust adjusting screw as shown in Fig. 6-26B.

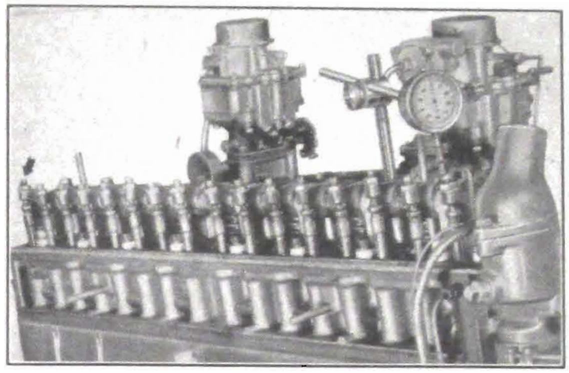


Fig. 6-26B. Checking with Indicator

5. Rotate flywheel each direction from center position until left-hand mark moves to the right-hand side of flywheel housing and vice versa.
6. Hold rocker arm to impose light pressure downward on ball stud while turning flywheel. An indicator reading of over .002" indicates an imperfect shaft, although readings of .004" or more are required to cause low speed missing.
7. To check No. 1 inlet, rotate flywheel until No. 8 inlet valve is wide open and proceed as before. To check No. 2 exhaust, have No. 7 exhaust wide open, etc. In every case locate wide open position of corresponding opposite valve to the cam to be tested. See Fig. 6-26C.

TIMING CHAIN AND SPROCKETS

All series use chains 1" in width. Initial slack in the chain when new should allow from 1/4" to 3/8" finger movement of the loose span between

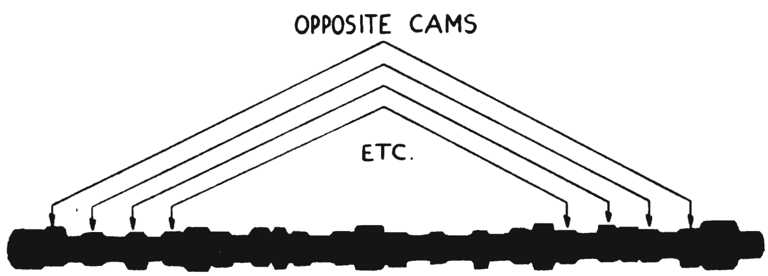


Fig. 6-26C. Opposite Cams

sprockets away from the centerline. Permissible slack can be as high as 1" outward before it should be necessary to replace chain.

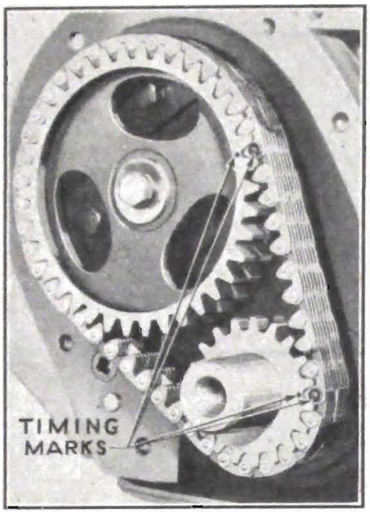


Fig. 6-27. Timing Chain and Sprocket Marks

ENGINE MOUNTINGS AND IDENTIFICATION

Front engine mountings on all series are the same as used in 1941 except for Series 90.

Front mountings are same for Series 40-50-60-70. However, on Series 40-50 the bolt flange is toward the rear while on Series 60-70 the bolt flange is toward the front. See Fig. 6-29. Left and right hand mountings are the same.

Series 90 uses a similar shaped front mounting as used on other series but bolt holes are different. Therefore Series 90 front mounting will not fit other series. Left and right hand mountings are different.

Mountings are identified by part numbers moulded in rubber part of mounting. Usually two part numbers will be found on each mounting. Each part number is followed by name of a color.

Example: 1313295—Black
1315443—Red

This means that if rubber of mounting is black, 1313295 is the part number. However, if rubber is red or a red paint mark is on mounting, 1315443 is correct part number.

A single mounting, located at bottom front side of transmission, is used to support the rear of the engine. See Fig. 6-28. This mounting is

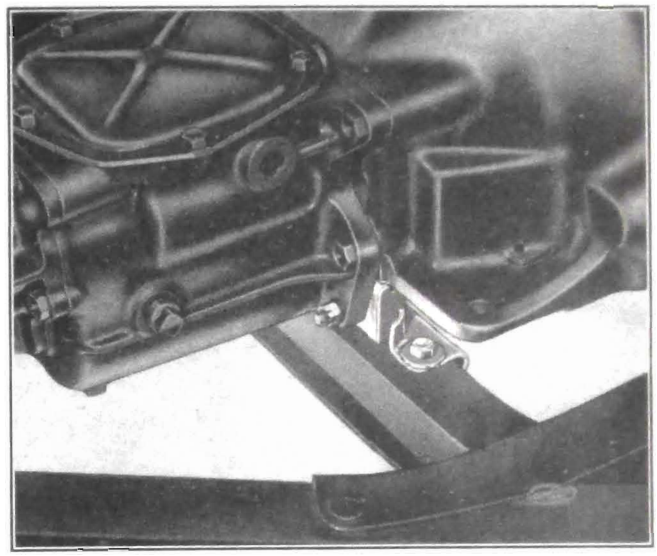


Fig. 6-28. Rear Engine Mounting

attached to the forward face of the transmission case by means of two studs. It is attached to the motor support cross member by means of two bolts through the top of the support and one bolt through the forward web of the support. Shims are provided for spacing the mounting fore and aft. See Fig. 6-30. These shims are located between the forward web of the motor support member and the lower mounting flange and only serve to fill the space which normally occurs between these two parts. This mounting is not adjustable for height and must be allowed to take its natural position fore and aft before tightening in place.

Series 40-50 uses a center engine mounting with softer rubber than is used on Series 60-70-90. Mountings for all series are same size and shape.

These mountings are identified same as front mountings are identified in that two part numbers are moulded in each mounting and the color of the rubber or paint mark used to determine correct part number.

The transmission support mounting also serves as an engine mounting. This is a saddle type mounting attached at the torque ball. This mounting serves to hold the rear of engine in its normal position and is not intended to support any of the engine weight.

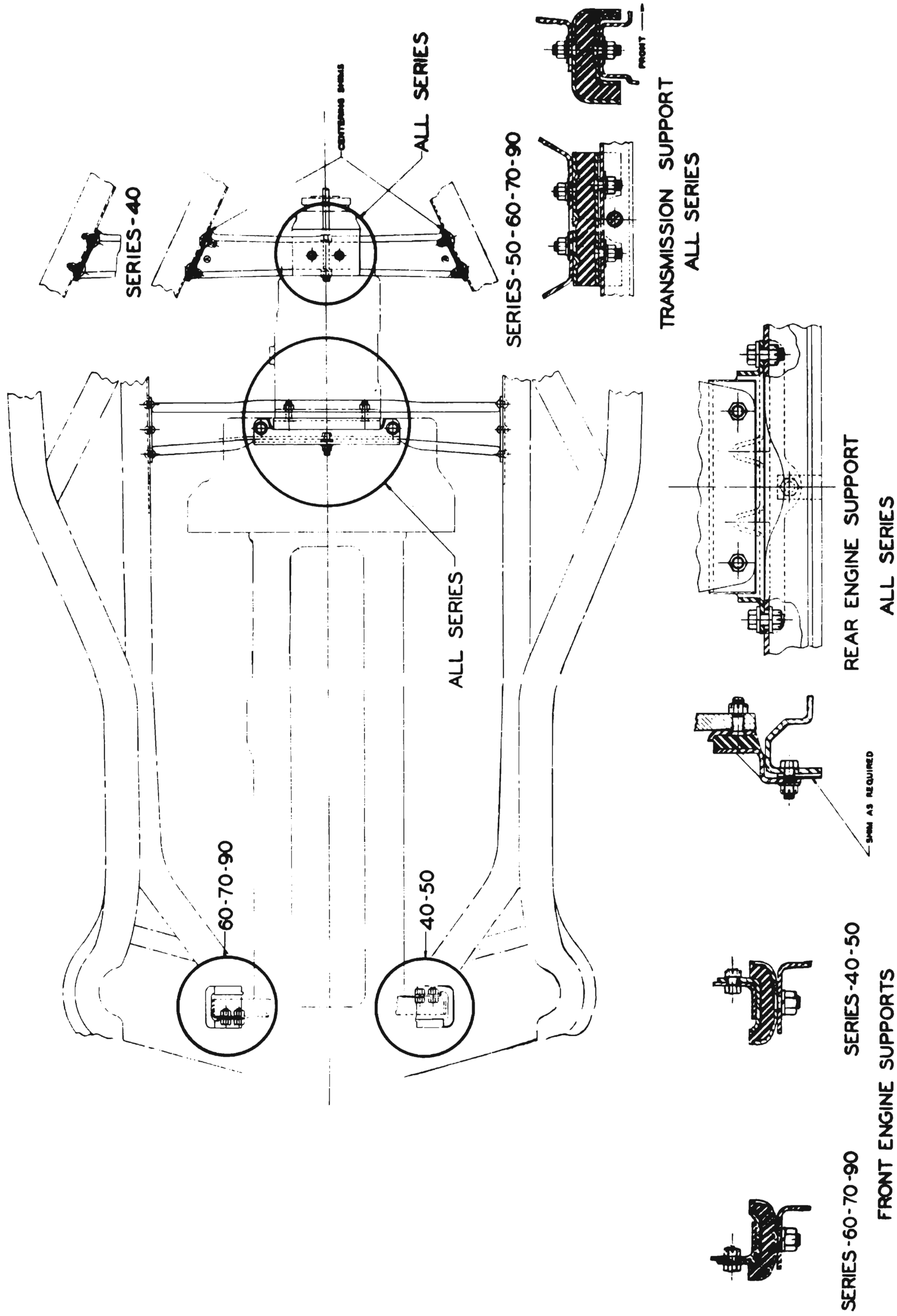


Fig. 6-29. Engine Mountings—Installation

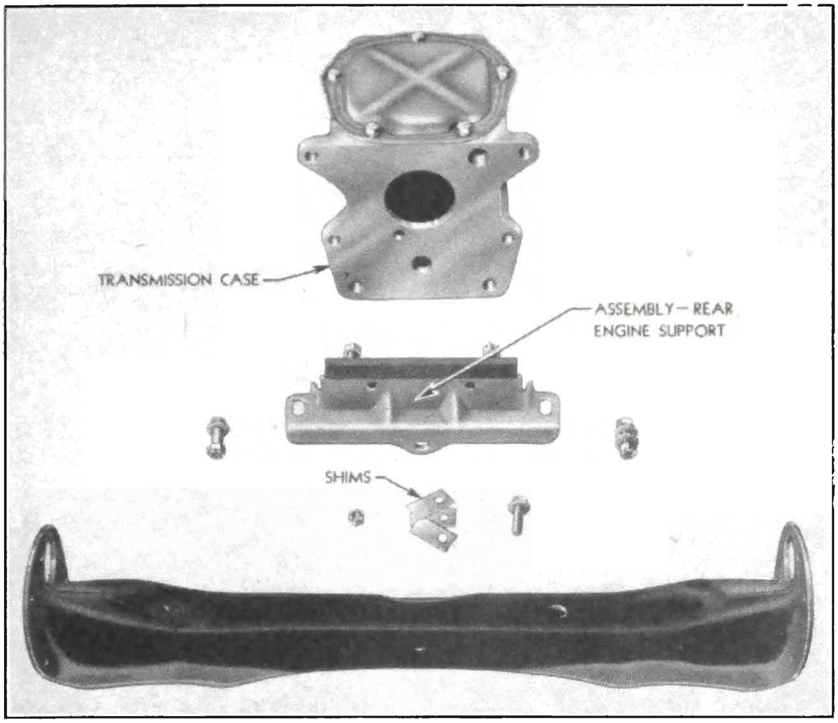


Fig. 6-30. Rear Engine Mounting Disassembled

The thin section of the transmission support mounting is to be installed toward front of car. See Fig. 6-29.

Series 40-50 use softer transmission support mounting than is used on Series 60-70-90.

These mountings are identified same as other rubber mountings.

Engine Mounting Adjustment

Rod which runs from transmission support must be loosened in transmission support mounting and all mountings must be loose where fastened to frame. See Fig. 6-29.

Transmission support mounting must be tightened to driving ball but transmission support must be loosened where ends of support contact frame X-member.

Torque tube and ball joint must be centered in gussett of frame X-member.

After engine assembly has been loosened as outlined the following procedure will give correct mounting adjustment.

1. Tighten both front engine mountings to engine and frame.
2. Tighten center engine mounting to transmission and frame cross member. Use shims as necessary, between forward web of motor support frame member and the lower mounting flange.
3. Tighten transmission support mounting to transmission and transmission support.
4. Shim transmission support as necessary where it is attached to frame. This must be done without straining support out of normal position.
5. Tighten rod in transmission support, being careful not to cause any "push" or "pull" tension in rod.

COMPRESSION CHECK

With fully charged battery, engine warmed up and fully broken in.

1. Remove all spark plugs and high tension wire from spark coil.

2. Insert compression gauge in a spark plug hole and hold it tightly.

3. Crank engine with starter, holding throttle wide open, until the gauge reaches its highest reading, which requires only a few turns of the engine. Repeat the same test on all cylinders. Cylinders should register within six pounds of each other. Compression on all cylinders should be 110 lbs. or better.

Compressions will read lower during hot weather than during cold weather.

Should you have a low compression reading on two adjoining cylinders, it indicates the possibility of a leak from one cylinder to another, usually caused by a leak at the cylinder head gasket.

If the compression readings are low, or vary widely, the cause of the trouble may be determined by injecting a liberal supply of oil on top of the pistons of the low reading cylinders.

Crank the engine over several times, and then take a second compression test. If there is practically no difference in the readings when compared with the first test, it indicates sticky or poorly seating valves. However, if the compression on the low reading cylinders is higher with oil sealing pistons and about uniform with the other cylinders, it indicates compression loss past the pistons and rings.

FLYWHEEL

Flywheels are balanced separately from the crankshaft assembly.

Series 40-50 flywheels are attached to crankshaft with bolts, lockwashers, and nuts. It is necessary to remove the rear main bearing cap when removing the flywheel.

The flywheels used on the Series 60-70-90 engines are attached to the crankshaft with bolts and threaded dowel nuts as shown. When removing these flywheels it is not necessary to remove the rear main bearing. See Fig. 6-31.

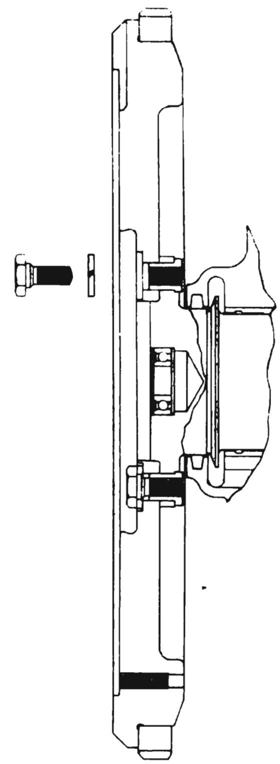


Fig. 6-31. Flywheel Bolt Removal—Series 60-70-90

STARTER RING GEAR

When removing a starter ring that is to be replaced, drill a $\frac{5}{16}$" hole in the ring, and gear can then easily be split with a cold chisel.

To install a new ring, heat the ring by laying on a hot plate, to approximately 600° F., and then place on the flywheel, tapping into position. When a hot plate is not available lay the ring on a piece of metal, asbestos or concrete floor and heat with a torch, taking care to keep the torch moving and heat evenly. Heating the ring in excess of 800° F. will destroy the effect of original heat-treatment.

Excessive heat applied to starter ring gears may be avoided by polishing several spots on the starter ring. Use emery cloth or sandpaper. When these brightened spots begin to turn blue the ring is as hot as it should be heated.

FLYWHEEL HOUSING

The housing is bolted to the rear of the crankcase and two ½" dowels maintain alignment. In production the pilot hole for the transmission is bored, after assembly to the crankcase, for proper alignment of engine, clutch and transmission.

Flywheel Housing Alignment

Misalignment between the flywheel housing and crankshaft may cause the transmission to slip out of high gear or the transmission to be noisy.

The flywheel housing furnished for service is completely machined but it is possible to assemble out-of-line with the crankshaft. When installing a new crankcase or new flywheel housing the alignment should be checked and corrected as follows:

Remove transmission and clutch assembly, leaving flywheel in place. Remove two opposite nuts from flywheel bolts, fasten Pilot Indicating Tool J-808-1 to the bolts and replace the nuts. Assemble Dial Indicator Sleeve KMO-30-K, Dial Indicator Hole Attachment KMO-30-F, and Dial Indicator KMO-30-F to Pilot Indicating Tool. See Fig. 6-32.

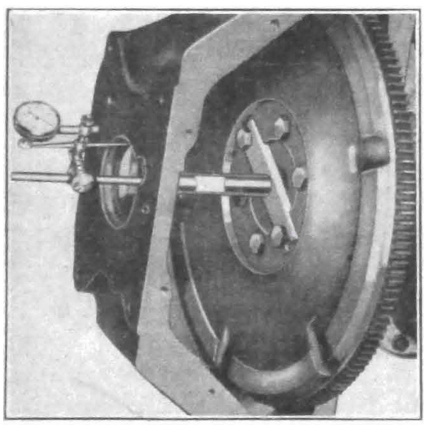


Fig. 6-32. Indicating Flywheel Housing Alignment

With engine in the car or supported as when in the car, turn the crankshaft slowly and check run-out of the transmission pilot hole. If the indicator reading is more than .005", correction should be made as follows:

Remove flywheel, flywheel housing, and the two dowels. Removing the engine from the car is unnecessary. On the Series 40-50 it is first necessary to remove rear main bearing before the flywheel bolts can be taken out permitting removal of the flywheel. In this case reinstall

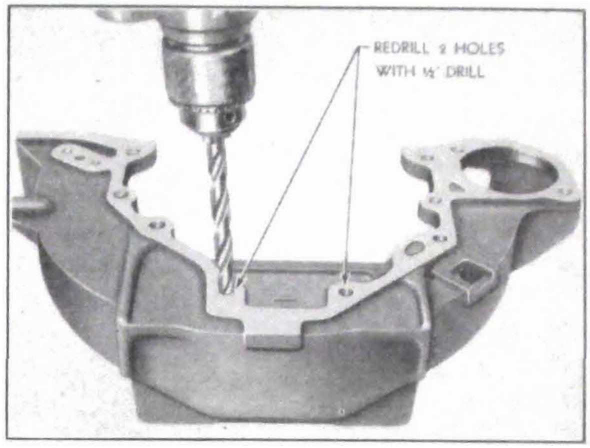


Fig. 6-33. Enlarging Holes in Housing

the rear main bearing before rechecking the housing for run-out.

Drill out the two upper holes in the flywheel housing for crankcase bolts, using a ½" drill, as shown. See Fig. 6-33. Drill out the four bolt holes in the crankcase with a ½" drill, as shown. See Fig. 6-34. Bolt the flywheel housing back into place with all six bolts, but leave loose enough to permit tapping flywheel housing to a centered position.

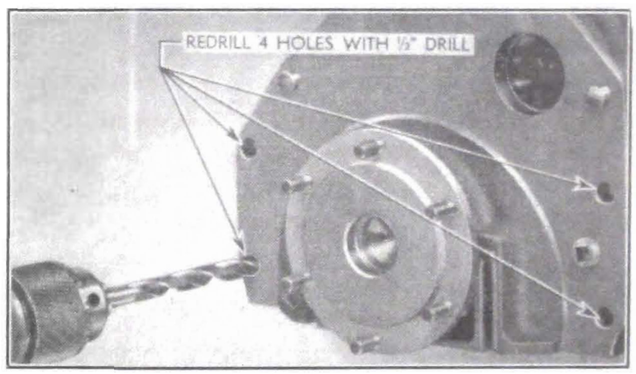


Fig. 6-34. Enlarging Holes in Case Flange

Reinstall the indicator tool and adjust the flywheel housing by tapping as desired until it is concentric within .002" indicator reading. Then tighten the six flywheel housing bolts securely and recheck the alignment with indicator. See Fig. 6-35.

Using a special $\frac{11}{32}$" reamer, J-808-4, and ratchet wrench, J-808-6, ream the dowel holes and install two oversize dowels, J-808-5. See Fig. 6-36. Reassemble flywheel, clutch and transmission.

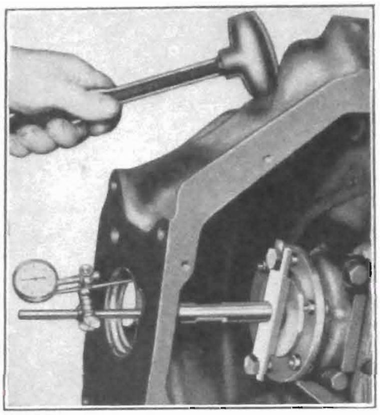


Fig. 6-35. Aligning Housing

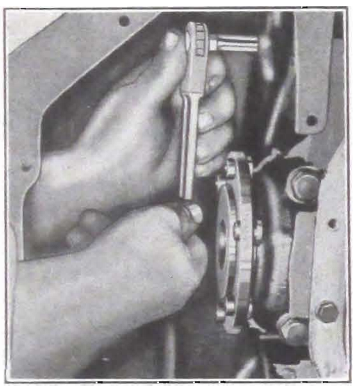


Fig. 6-36. Reaming Dowel Holes

Illustrations are taken from various angles to show more clearly the operations, but **in all cases when checking run-out of transmission pilot hole engine must be in upright position.**

After pilot hole is concentric and housing is permanently bolted and doweled in position, check alignment of rear face of flywheel housing at a radius of 2½".

If indicator reading is greater than .005", use paper shims of proper thickness, shellacked in the correct position, to give an indicator reading of .005" or less.

Oversize Production Engines

Occasional engines are built at the factory equipped with .010" oversize pistons. These engines may be identified by a dash (—) following the engine number. Inasmuch as it will be the practice to hold .010" engines to the low limit on the bore, it will be possible to order .010" service pistons by part number only. In such cases it may be necessary to hone some of the bores slightly.

Cylinder Bores

When reconditioning cylinder bores, it is of the greatest importance that they be held to not more than .0005" out-of-round or tapered and that the final honing be done with the finest grade of stones. Smooth bore finish is of the utmost importance in avoiding ring scuffing and the maintenance of good oil consumption for the maximum mileage.

After honing or lapping cylinder bores, it is important that they be thoroughly washed in order to remove all traces of abrasive material. After bores are dry they should be brushed clean with a power-driven fibre brush.

If this is not done very rapid wear will result. Occasionally an engine which has been rebored uses oil excessively after sufficient mileage has been accumulated to break in new rings. This indicates that bores were not finished as smoothly as new engine bores. However, the rings will polish the bores but will wear the rings excessively in doing so. Installation of a new set of rings will usually overcome such cases. The bores should not be roughened when the second set of rings are installed.

Engine Roughness

Engine roughness may be caused by out-of-balance condition of combined clutch assembly, flywheel and crankshaft even though these units are originally balanced individually.

Connecting rods will also cause same kind of roughness if they are not all same weight. For connecting rods to be all of same total weight is not sufficient. All rods in a set must weigh same on top end and all weigh same on bearing end. For this reason rods must not be filed in service because elaborate fixtures are required for weighing individual rod ends.

Engines which have become rough due to installing one or more rods which are not same weight as other rods, can usually be balanced by procedure outlined below.

Roughness is usually apparent when driving at a certain speed as well as when idling engine at an equivalent speed. To correct, it is desirable to remove clutch assembly and try engine to determine whether or not clutch assembly is causing trouble.

If engine is still rough, insert one clutch retaining screw in flywheel and try in various positions around flywheel diameter, adding washers or reducing screw weight until right weight and flywheel position are determined for smooth engine. Remove weight and drill shallow holes in flywheel on opposite side from where weights were attached until enough weight is removed to make engine smooth. This same procedure may be followed without removing clutch.

Remove one screw and lockwasher holding clutch cover to flywheel and try engine for roughness. Reinstall screw and lockwasher and try with adjacent screw and lockwasher removed. Continue this procedure until engine has been tried with each screw removed separately.

Determine location of screw where the engine operated smoothest with screw removed. This location determines the heavy side of flywheel, crank and rod assemblies taken as a unit. If engine is equally smooth with an adjacent screw removed, this indicates that the heavy side of assembly is located between the two screws.

Never operate engine with more than one screw removed at a time.

Install all screws and lockwashers. Remove metal at heavy side of assembly by drilling into flywheel flange with 3/8" drill. Do not drill any holes more than 1/4" deep. Try engine intermittently to determine when sufficient metal has been removed.

See "Car Roughness Analysis" in Wheel and Tire Section.

ENGINE OILING SYSTEM

ENGINE OIL RECOMMENDATIONS

The grade of oil best suited for various air temperatures is shown on the Oil Viscosity and Temperature Chart

For Anticipated Minimum Atmospheric Temperatures Recorded Below

Temperature	Grade
Not lower than 32° F.	20-W or S.A.E. 20
As low as plus 10° F.	20-W
As low as minus 10° F.	10-W
Below minus 10° F.	10-W plus 10% Kerosene

VISCOSITY (Saybolt Universal)

Viscosity No.	0° F.		130° F.		210° F.	
	Min.	Max.	Min.	Max.	Min.	Max.
10-W*	5,000	10,000	...	...	...	...
20-W**	10,000	40,000	...	...	...	...
S.A.E. 20	.....	.....	120	185	...	...

*Sub-zero pour point. **Zero pour point.

Fig. 6-37. Engine Oil Viscosity and Temperature Chart

The use of 10-W oil plus 10% kerosene is recommended only for those territories where the temperature falls below minus 10° F. for protracted periods.

Summer

The use of 20-W or S.A.E. 20 oils during the summer months will permit better all-around performance of the engine than will the heavy body oils with no appreciable increase in oil consumption.

Engine Break-In

The oil in crankcase when car is received from factory should be used for the first 1000 miles. If car is shipped with crankcase drained, 10-W oil should be installed but should be drained after 1000 miles. For additional oil required during first 1000 miles use 10-W oil. Requirements after 1000 miles should be in accordance with Engine Oil Viscosity and Temperature Chart.

"Break-in" oils or compounds are entirely unnecessary. They should not be used under any circumstances unless the supplier can furnish satisfactory proof that the compound contains no harmful ingredients.

When to Change Crankcase Oil

Oils have been greatly improved, driving conditions have changed and improvements in engines, such as the crankcase ventilating system, have greatly lengthened the life of good lubricating oils. However, to insure continuation of best performance, low maintenance cost and long engine life, it is necessary to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal driving conditions draining the crankcase and replacing with fresh oil every 2000 to 3000 miles is recommended. Under adverse driving conditions it may become necessary to drain the crankcase oil more frequently.

Driving over dusty roads or through dust storms introduces abrasive material into the engine. Air cleaners decrease amount of dust that may enter the crankcase; however, if oil becomes contaminated, it should be drained promptly to prevent harmful engine wear. The frequency of draining depends upon severity of dust conditions and no definite draining periods can be recommended.

Short runs in cold weather, such as city driving, do not permit thorough warming up of the engine and water may accumulate in crankcase from condensation of moisture produced by burning of fuel. Water, in crankcase, may freeze and interfere with proper oil circulation. It also promotes rusting and may cause clogging of oil screens and passages. Under normal driving conditions this water is removed by crankcase ventilator but if water accumulates it should be removed by draining crankcase as frequently as may be required.

During winter months light or low viscosity oils are required to obtain easy starting. Therefore, at the beginning of the winter season the crankcase should be drained and refilled with oil of proper viscosity for winter use. On continuous hard driving, these light oils may thicken and cause starting trouble. More frequent oil changes may, therefore, be required during the winter months, and drainage period of 2000 miles for cars subjected to high speed driving conditions may be desirable, but under very severe conditions more frequent draining may be required to prevent starting troubles due to thickened oil.

It is always advisable to drain the crankcase after the engine has reached normal operating temperature. The benefit of draining is, to a large extent, lost if crankcase is drained when engine is cold as some of the suspended foreign material will cling to sides of oil pan and will not drain out readily with slower moving oil.

Crankcase Capacity	Ser. 40-50	Ser. 60-70-90
Dry engine	7½ qts.	9 qts.
To refill	5½ qts.	7 qts.

ENGINE LUBRICATION SYSTEM

Engine lubricating system is of the force-feed type. Oil is supplied under full pressure to main, connecting rod and camshaft bearings. See Fig. 6-38.

Cylinder walls and pistons are lubricated by oil forced through a small hole drilled through the lower end of each connecting rod which meters with the hole in crankshaft once in each revolution. See Fig. 6-18.

Piston pins are lubricated by oil holes through upper portion of the piston pin boss on the alloy type and by oil grooves cut in side of pin bushing on the cast iron type piston.

Timing chain and sprockets are lubricated by a small passage from the main oil line. The passage meters with recess in back side of camshaft thrust plate. A hole leading from recess

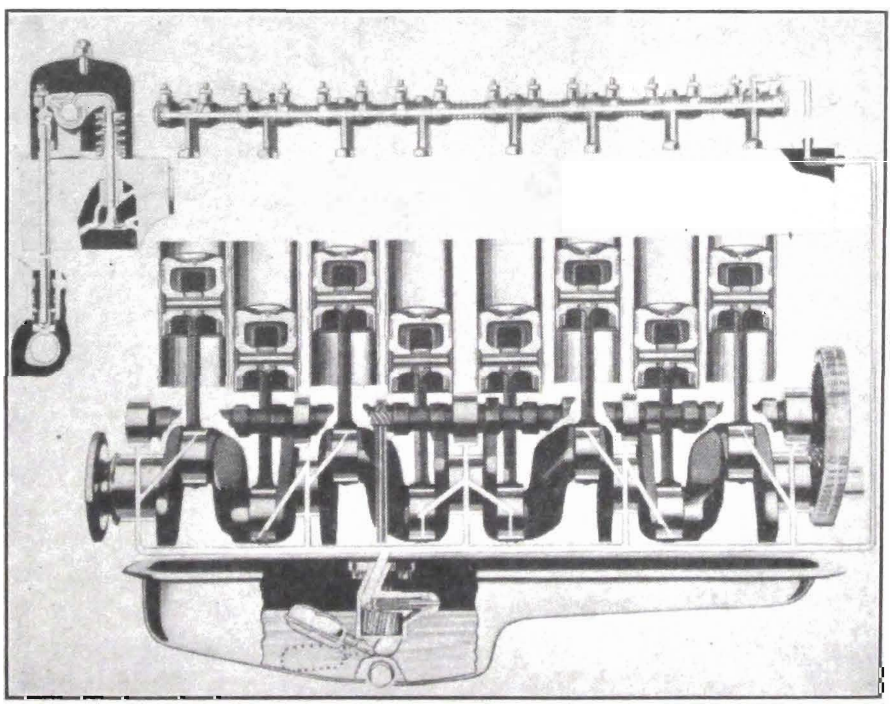


Fig. 6-38. Engine Lubrication System

to front side of plate is normally blocked by cam sprocket gear hub. Gear hub has slot which meters with hole in thrust plate once each revolution and allows oil to be thrown to inside diameter of sprocket gear. Three holes in the sprocket gear allow oil to pass to chain.

Oil is carried to the rocker arm shaft through a pipe from the crankcase oil passage. The oil outlet fitting in cylinder head is restricted. This fitting is identified by a ring cut around outer part of fitting. See Fig. 6-21. This restriction reduces the pressure at which oil is fed into the rocker arm shaft. Holes in the shaft feed oil to the rocker arm bearings under a light pressure, and the surplus oil is carried through oil holes at rear of rocker arms to the push rod balls.

A special cylindrical screen with one open end is used under the connection where the oil line to the rocker arm assembly is attached to the cylinder head. To obtain access to this screen, disconnect the line, and remove fitting. This screen can best be removed using a wood screw inserted far enough to act as a puller.

The oil filler cap is located on the top of the rocker arm cover.

OIL PUMP

The oil pump is located in the lowest point of the lower crankcase and driven by the camshaft

Fig. 6-39. Oil Pump Floating Screen

through spiral gears. It consists of two helical spur gears enclosed in a one-piece housing. The corners of the gears on the side opposite the cover are rounded to fit fillets machined in pump body. The pump is provided with a non-adjustable relief valve to control oil pressure. The oil relief valve has a $\frac{3}{64}$″ hole to reduce pressure at low engine speeds. See Fig. 6-39.

Under normal operating conditions the oil pressure on all series is 45 lbs.

Oil pump idler gear shaft is copper plated to prevent scoring during break-in.

Oil pump screen on all series is #16 mesh. Hard wire is used to prevent distortion.

See Electrical Section for "Distributor and Oil Pump Drive."

Oil Pump Screen

A floating oil pump screen is used on all series engines. It is attached to the lower face of a sheet metal dome with a sealed air compartment. The inlet pipe leading to the oil pump also acts as a bearing about which this dome is free to pivot so that it will float at the top of the oil in the engine pump. A stop limits the upward and downward movement of this float beyond a normal range and with the oil level at the "full" mark on the oil gauge stick the float is against the upper stop. This permits the oil pump to draw clean oil from the top of the oil in the sump and allows sediment to settle to the bottom of the sump. Should the oil level at the pump be temporarily lowered by a sudden lurch of the car or other cause, the pivot for the oil screen float allows it to follow the oil level and maintain a positive supply of oil to the pump.

Should the oil pump screen become clogged due to abnormally thick oil, sludge, or other cause, suction of the oil pump will cause the screen to collapse at its center and open a valve that will allow oil to be drawn unobstructed to the pump inlet.

OIL FILTER

AC Kleer Kleen oil filter is standard equipment on all engines. Oil from the crankcase enters the filter from the oil gallery on side of block. Oil leaves the filter and returns to the crankcase through a fitting in the block on Series 40-50 and through head of special cap screw used in center valve push rod cover on Series 60-70-90. See Figs. 6-2 and 6-4.

The amount of oil fed to filter is governed by a restricted fitting attached to oil gallery on side of block.

The oil filter has no by-pass, therefore when it becomes filled with accumulated dirt, a new replacement element should be installed—otherwise the filter ceases to function. The life of filter element varies with operating conditions but ordinarily will be 6,000 to 8,000 miles.

Elements kept in operation too long will become wedged in housing and removal may be difficult.

When oil level markings on oil gauge stick cannot be seen clearly through the oil film, this indicates the need of a new replacement element.

The correct renewal element is AC Type L-11. No other type is recommended. See Fig. 6-40.

To service filter when new element is used: Remove cover from filter, remove element and with a clean cloth free of lint wipe container to remove any sediment. Replace element. Replace cover, using new gasket. Start engine and allow filter to fill and check for oil leak at cover.

ENGINE VENTILATING SYSTEM

Engine ventilation is the positive suction type with a crankcase inlet filled with gauze located at left side of engine. The outlet is from the the top of rocker arm cover to the air cleaner. The rocker arm cover at outlet has a deflector with gauze assembled to prevent oil mist being pulled through ventilator. See Fig. 6-41.

The ventilating system does not remove all fuel dilution because a small amount is advantageous in cold weather. It does, however, prevent an accumulation of more than 20% fuel dilution and removes all water under average driving conditions.

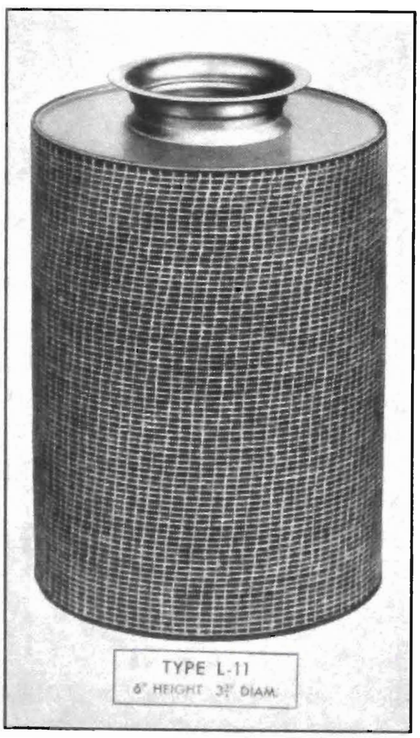


Fig. 6-40. Oil Filter Element

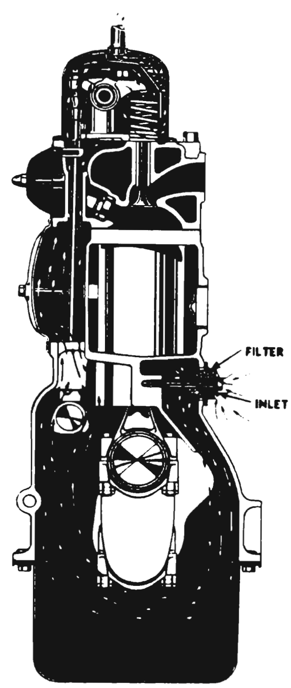


Fig. 6-41. Crankcase Ventilation—Sectional View

ENGINE COOLING SYSTEM

Pressure cooling system is used on all series. Pressure is accomplished by sealing the system with a combination radiator filler cap and a 7 lb. pressure control valve. Raising the system pressure is for the purpose of increasing the boiling point of the radiator solution.

Care should be used when removing radiator cap with solution at a temperature above its boiling point at atmospheric pressure.

When removing cap, if coolant is hot, rotate counter-clockwise until a step is felt. This is the vented position which allows pressure and vapors to escape. Keep cap in this position until all pressure is released, then turn cap in same direction and remove.

RADIATOR

Radiator cores are Harrison V-Type Cellular with copper water passages and copper cooling fins. Radiator core sizes are as follows:

Series	Thick	Width	Height
40-50	2"	17 7/16"	24"
60-70-90	3"	17 7/16"	24"

WATER PUMP AND FAN ASSEMBLY

All series use same pump. See Fig. 6-42.

A ball bearing water pump of the packless type is used on all series.

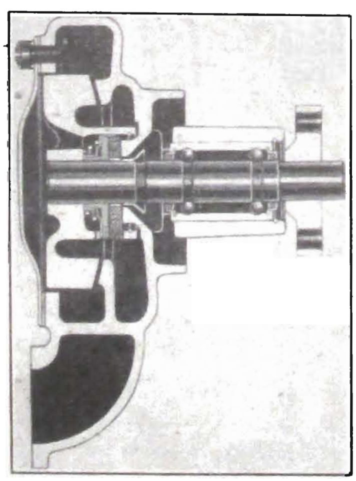


Fig. 6-42. Water Pump

The ball bearing of pump is sealed at each end to exclude dirt and water and is lubricated for life of bearing.

The non-adjustable self-aligning packless seal consists of a special rubber cup which fits tight and seals on pump shaft and is held in contact with the sealing disc by spring pressure. The seal assembly is held in impeller by a snap ring. The seal assembly turns with shaft and impeller and forms its seal by contact of sealing disc against the contacted surface of the pump body.

Disassembly of Pump

1. Remove fan and fan pulley.
2. Remove fan hub from pump shaft. Use tool J-679-A.
3. Remove cover plate from back of pump body. See Fig. 6-43.

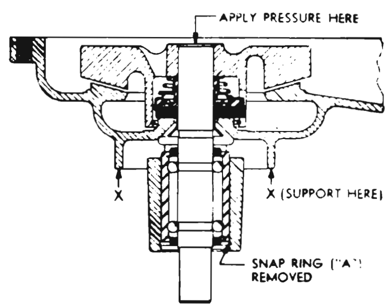


Fig. 6-43. Removing Impeller Shaft and Bearing

4. Remove snap ring "A" as shown from pump body. Be sure and remove this snap ring before performing the next operation.
5. Support pump body at points "X" and press shaft through impeller. Continued pressure on pump shaft will remove shaft and bearing assembly from pump body.

Assembly of Pump

1. Inspect pump body and make certain that surface against which sealing disc bears is smooth and free from burrs. If it is not, a new pump body must be used.
2. Install shaft and bearing assembly in the pump body, using an arbor press. When performing this operation, apply pressure

to outer race of bearing as shown. Do not apply pressure to pump shaft or bearing seal, as damage to these parts would result. Press bearing assembly into the pump body until seated, then reinstall snap ring. See Fig. 6-44.

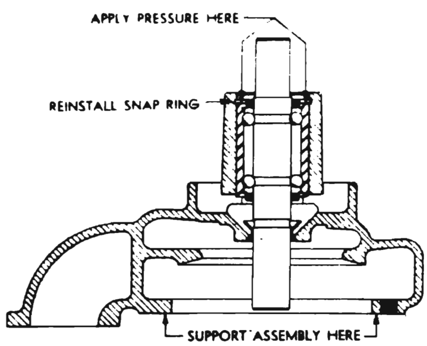


Fig. 6-44. Installing Shaft and Bearing Assembly

3. Replace the fan hub by supporting above assembly of pump body and shaft at impeller end of shaft as shown. Leaving pump body free to float, press fan hub onto shaft to dimension shown. See Fig. 6-45.

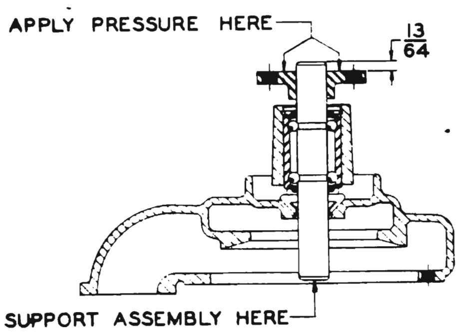


Fig. 6-45. Installing Fan Hub

4. Apply a small quantity of heavy lubricant to impeller end of pump shaft. This will protect the rubber seal from becoming damaged when impeller is pressed on shaft.

   Press impeller and seal assembly on pump shaft, supporting pump body and shaft assembly at fan end of shaft as shown until impeller is flush with end of shaft. See Fig. 6-46.

5. Replace cover plate on rear of pump body by using a new gasket shellacked in place.

Water pump bearing must be protected from heavy pressures or hammer blows during water

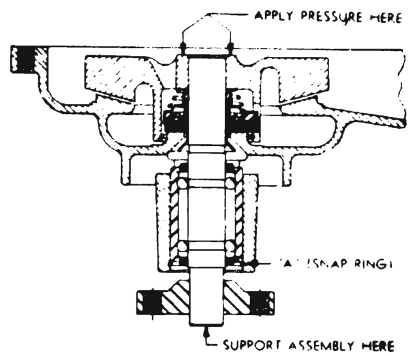


Fig. 6-46. Installing Impeller and Seal Assembly

pump service work. Otherwise, bearing may become brinelled resulting in noise or failure.

FANS

Fans are four-blade offset type and are attached to the water pump flange by four screws. Fan diameters are:

All Series .... 18"

Fan Belt

A V-type belt drives the water pump, fan and generator from a pulley attached to front end of the crankshaft. The belt should be adjusted so

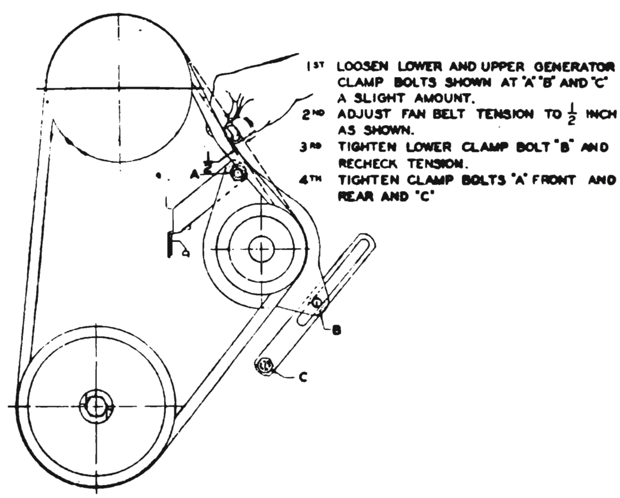


Fig. 6-47. Fan Belt Adjustment

that it will deflect approximately ½" with a light pressure at the center of belt between the generator and fan pulleys. Fig. 6-47. **If belt is too loose it will slip and wear excessively.** Loose belts will also cause noise similar to spark rap at high speed. If too tight the generator and pump shaft bearing will wear rapidly. Fan belt width:

Series 40-50 .... ¾"
Series 60-70-90 .... 1"

THERMOSTAT

Thermostatically operated by-pass type of water temperature control is used.

This system of engine water temperature control permits the water pump to circulate coolant through the engine during the warm-up period, without passing through the radiator, thus allowing the engine to reach its normal operating temperature quickly. See Fig. 6-48.

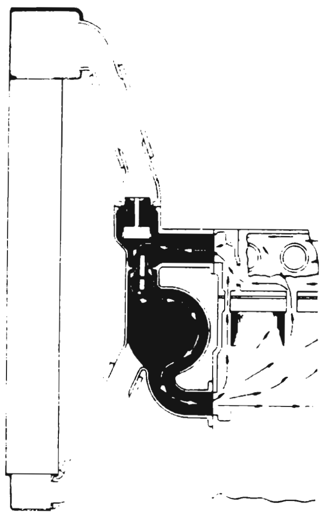


Fig. 6-48. Recirculation

This is accomplished by means of a thermostat located in the passage of the cylinder head water outlet, and a spring-loaded valve located in the water passage between the cylinder head water outlet and water pump inlet.

This spring-loaded valve is smaller than the neck where it is located and this allows a fixed orifice. The total area of this orifice is equivalent to a ½" hole, and permits circulation when the engine is either idling or not running.

When the coolant is below normal operating temperature, it is blocked from circulation through the radiator by the thermostat valve. The pump pressure forces the coolant through the by-pass valve and allows coolant to recirculate through the cylinder block and head.

When the coolant has reached a temperature of 148° to 155° the thermostat valve starts to open and the circulation proceeds in the normal way. At approximately 173° the thermostat is fully open, relieving the water pump pressure on the by-pass valve which automatically closes. See Fig. 6-49.

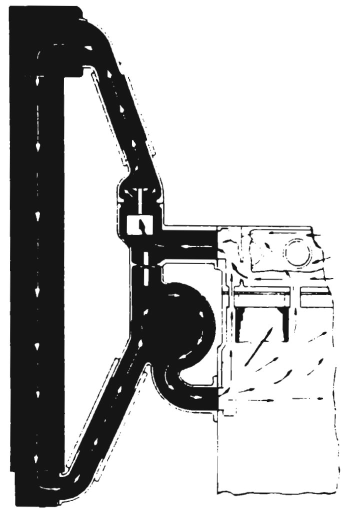


Fig. 6-49. Normal Circulation

It is important after radiator cleaning products have been used, that all traces of the cleaning material should be removed from the system by reverse flushing the block and radiator using water (hot if possible) and air.

Thermostat must always be removed before using "Radiator flusher."

Removal of Thermostat

The thermostat unit may be removed by the removal of two screws at cylinder water outlet flange.

Inspection of Thermostat

Thermostats may be tested for operating at the correct temperature as follows:

Immerse the thermostat unit, together with a thermometer, in a container of water. Agitate the water to insure both water and thermostat being at a uniform temperature. When heating the water, do not allow thermostat or thermometer to rest on bottom of the container, as this will cause the thermostat or thermometer to be at higher temperature than the water.

At a temperature of 148° to 155° the valve should start to leave the seat and be fully open at a temperature not to exceed 175°.

A thermostat sticking closed, or a sticking by-pass valve either open or closed, will prevent the cooling system from functioning and cause over-heating.

WATER TEMPERATURE GAUGE

A water temperature gauge is mounted in the instrument panel to indicate the temperature of engine coolant. This gauge consists of an indicator on the dash connected to a bulb by means of a capillary tube. The bulb is mounted in the cylinder head.

Care should be used to prevent damage to bulb or capillary tube during service operations.

Radiator Flushing

Tool J-708-A will prove very satisfactory for this work. See Fig. 6-50A.

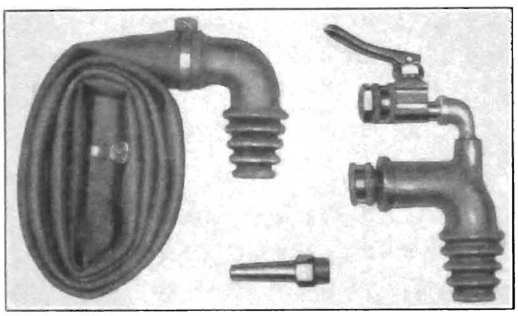


Fig. 6.50A. Radiator Flusher J-708-A

Due to accumulation of corrosion and other foreign materials which tend to plug radiator core, it is advisable to periodically clean the cooling system in order to maintain satisfactory performance.

It is recommended that the cooling system be cleaned before rust preventive is added, particularly after draining anti-freeze solutions.

DRAINING COOLING SYSTEM

A drain cock is located on the radiator lower tank front face for all series.

The engine water jacket in all series is drained by the removal of a pipe plug which is located on the right side near the rear of the engine.

To completely drain the cooling system, it is necessary to drain at both of above points.

When draining the cooling system for protection against freezing, be sure to also drain the car heaters.

For dash type heater installation, disconnect the hose at the lower heater connection.

For underseat type heaters, disconnect one hose line at the heater. Disconnect other hose line at engine and blow air through hose disconnected at engine. This displaces water held in heater core as result of capillary attraction.

The radiator cap should be loosened to allow the solution to drain properly.

COOLING SYSTEM RUST PREVENTIVE

Radiator Rust Preventive, available through G.M. Parts Warehouses as a G.M. Package, Part #985063, containing 4 ounces, has been found to be an effective preventive of rust or corrosion of the metal parts of the cooling system. When used in the correct proportions it first forms a milky white emulsion with the water and after several days use deposits a protective coat over the metal surfaces. This coating does not affect the efficiency of the cooling system but, by preventing rust or corrosion, maintains the cooling system at its original efficiency.

This solution is not a cleaning agent and has no anti-freeze properties. It does not interfere with the functioning of approved anti-freezes and its functioning is not affected by them. Its sole purpose is the prevention of rust and corrosion.

Directions for Use

New Cars

Radiator Rust Preventive should be added to the coolant of all new cars during the initial servicing in the proportion of 1 ounce per gallon of water, and this treatment should be repeated once a year or after cooling system has been thoroughly flushed.

Practically all anti-freeze solutions contain an inhibitor or rust preventive. Therefore, caution should be exercised when adding rust preventive to such solutions because an **excessive quantity of rust preventive will deteriorate rubber hose connections.**

Used Cars

Clean the cooling system thoroughly and use Radiator Rust Preventive in the proportion of 1 ounce per gallon of water.

NOTE: Rust preventive solutions, other than the one mentioned above, may be purchased from reliable sources of supply and if used in accordance with the manufacturer's specifications, equally satisfactory results should be obtained.

ANTI-FREEZE SOLUTIONS

In selecting anti-freeze, local conditions and type of service must be considered.

Alcohol

Alcohols are sold in various concentrations as well as under various trade names, therefore, alcohols should always be used in the proportions recommended by the anti-freeze manufacturer.

GM Anti-Freeze is a highly concentrated alcohol requiring considerably less material for the same freezing protection than some of the other less concentrated alcohol products.

Alcohol solutions are volatile, therefore it is impractical to use a higher opening thermostat in connection with hot water car heaters than the standard thermostat furnished by the car manufacturer.

Alcohol is not injurious to the materials used in the cooling system and no particular damage results when small quantities get into the crankcase.

The car finish can be damaged by contact with alcohol or its vapors, and any material accidentally spilled on the finish should be flushed off immediately with a large quantity of clean, cold water.

Slight evaporating losses occur with all alcohol anti-freeze solutions. A major loss of solution results when the solution is allowed to boil. This is usually the result of using a solution too highly concentrated, the use of high opening thermostats, idling the engine for long periods of time, or suddenly stopping the engine following a hard run.

In order to maintain the proper freeze protection, the solution should be periodically checked with a hydrometer and alcohol added in accordance with the freezing protection desired. See GM Anti-Freeze Chart.

NOTE: *GM Anti-Freeze,* now being stocked in all General Motors Parts Division Warehouses, is an alcohol preparation and is volatile; it contains a "rust preventive" which is not injurious to rubber hose connections.

Radiator Glycerine (Anti-Freeze Grade)

Radiator Glycerine produced under the formula approved by the Glycerine producers association and sold in the United States for anti-freeze purposes, is chemically treated to overcome the difficulties presented with untreated Glycerine and under normal operating conditions should be satisfactory for use in the cooling system.

Glycerine in first cost is more expensive than alcohol but as it is not lost by evaporation, only water need be added to replace evaporation losses. Any solution lost mechanically must be replaced by additional new anti-freeze solution. Cooling solution should be checked from time to time with a proper hydrometer for freezing point.

Because of the high boiling point of glycerine, a higher opening accessory thermostat (160°) can be used and more heat obtained from car heaters than would be possible with the standard thermostat.

The solution under ordinary conditions is not injurious to the car finish.

The principal objection to glycerine is the gumming and sticking of the moving engine parts in event the solution leaks into the crankcase.

All Radiator Anti-Freezes on the market should be used in accordance with the instructions and in proportions recommended by the anti-freeze manufacturer.

Unsatisfactory Anti-Freeze Solutions

Salt solutions, such as calcium or magnesium chloride, sodium silicate, etc., honey, glucose, sugar solutions, untreated glycerine, oils, and untreated ethylene glycol are not satisfactory for use in automobile radiators.

Testing Solutions

Use only hydrometers which are calibrated to read the gravity and temperature and have a table or other means of converting the freezing point at various solution temperatures.

Care must be exercised to use the correct float or table for the particular solution. It is not practical to mix various types of anti-freeze in the same solution as it will not be possible to determine freezing point, using a hydrometer.

COOLING SYSTEM CAPACITY

Model and Year	Capacity (qts.)
1931-50	12
1931-60	15
1931-80-90	19
1932-50	12
1932-60	16
1932-80-90	19
1933-50	12
1933-60	16
1933-80-90	19
1934-40	13¼
1934-50	15½
1934-60	18
1934-90	23

Model and Year	Capacity (qts.)
1935-40	13¼
1935-50	15½
1935-60	18
1935-90	23
1936-40	13¼
1936-60-80-90	17
1937-40	13¼
1937-60-80-90	17
1938-40	13¼
1938-60-80-90	17

Model and Year	Capacity (qts.)
1939-40	13¼
1939-60-80-90	17
1940-40-50	12½
1940-60-70	16
1940-80-90 (with heater)	18
1941-40-50	13
1941-60-70	16¾
1941-90	18
1942-40-50	13 ●
1942-60-70	16¾ ●
1942-90	18 ●

NOTE: Above capacities are without heaters. If car is equipped with heater add 1¼ qts. for all series. ●

Quarts of GM Anti-Freeze Required for Protection at Following Temperatures

System capacity (quarts)	+20° F.	+10° F.	0° F.	—10° F.	—20° F.	—30° F.	—40° F.
	13.5%	22.5%	29.75%	35.75%	41.25%	46.7%	51.25%
10	1½	2¼	3	3¾	4¼	4¾	5¼
11	1½	2½	3½	4	4¾	5¼	5¾
12	1¾	2¾	3¾	4½	5	5¾	6¼
13	2	3	4	4¾	5½	6¼	6¾
13¼	2	3	4	4¾	5½	6¼	7
14	2	3¼	4¼	5¼	6	6¾	7¼
15	2¼	3½	4½	5½	6¼	7¼	7¾
16	2¼	3¾	5	5¾	6¾	7½	8¼
17	2½	4	5¼	6¼	7¼	8	8¾
18	2½	4¼	5½	6½	7½	8½	9¼
19	2¾	4½	5¾	7	8	9	9¾
20	2¾	4½	6	7¼	8¼	9½	10¼
21	3	4¾	6¼	7¾	8¾	10	11
22	3	5	6¾	8	9¼	10½	11½
23	3¼	5¼	7	8¼	9½	10¾	12
24	3¼	5½	7¼	8¾	10	11¼	12½
25	3½	5¾	7½	9	10½	11¾	13
26	3¾	6	7¾	9½	10¾	12¼	13½
27	3¾	6¼	8¼	9¾	11¼	12¾	14
28	4	6½	8½	10¼	11¾	13¼	14½
29	4	6¾	8¾	10½	12	13¾	15

MANIFOLDS AND HEAT CONTROL

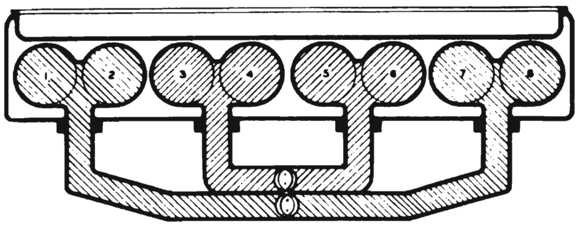


Fig. 6-50. Fuel Distribution—Single Carburetor

The type of intake manifold, exhaust manifold, and heat control used depends upon carburetion equipment.

Series 40 engines are equipped as "standard" with one dual carburetor.

This series is also available *optionally* equipped with compound carburetion. This means that two dual carburetors are used on one dual manifold.

All Series 50-60-70-90 engines are equipped as "standard" with compound carburetion. See Fig. 6-5.

INTAKE MANIFOLD

All Series

Dual type manifolds are used on all series regardless of whether one carburetor or compound carburetion is used.

The outside branch of all manifolds supplies cylinders Nos. 1, 2, 7 and 8. The inside branch supplies cylinders Nos. 3, 4, 5 and 6. Where compound equipment is used, either carburetor can feed all cylinders. See Fig. 6-51.

On Series 40 using one dual carburetor, the three rear legs of intake manifold are offset at right angles to offset tilt of engine and allow level mounting.

On engines using compound carburetion the manifold branches are tilted same as engine. The mounting for each carburetor is tilted in relation to manifold so that carburetors will set level.

All manifolds have a heat jacket cast around the section directly below carburetor mounting. Series 40 manifolds built to use one dual carburetor have only one heat jacket. See Fig. 6-52.

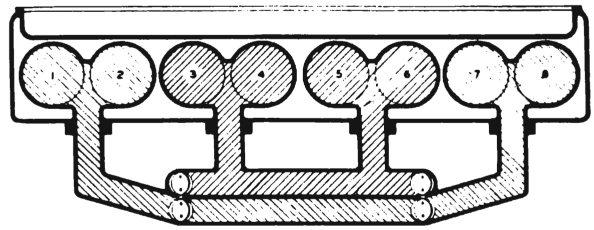


Fig. 6-51. Fuel Distribution—Compound Carburetion

All manifolds built to use compound carburetors have two heat jackets. See "Heat Control."

EXHAUST MANIFOLD

Series 40 engines using one dual carburetor are equipped with one-piece exhaust manifold. See Fig. 6-53.

All series engines equipped with compound carburetion have exhaust manifolds made in two separate sections. See Fig. 6-54. Both front and rear sections are equipped with thermostatically controlled heat valve assemblies. Heat valves on these assemblies are not serviced separately except for thermostatic springs and such parts as can be removed without breaking welds.

Front sections of these manifolds are equipped with automatic choke heat tubes.

Exhaust manifolds should not be removed while engine is hot because warpage is likely to occur as a result.

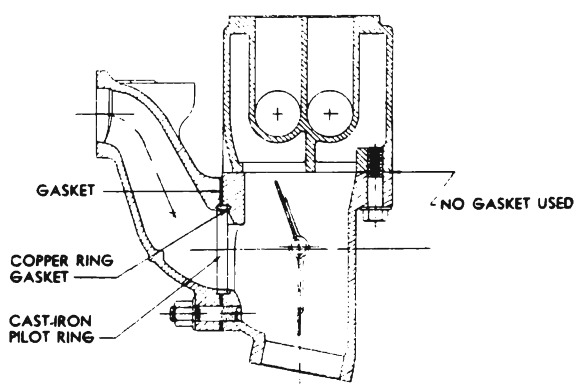


Fig. 6-52. Center Section—Exhaust and Intake Manifold and Heat Trap

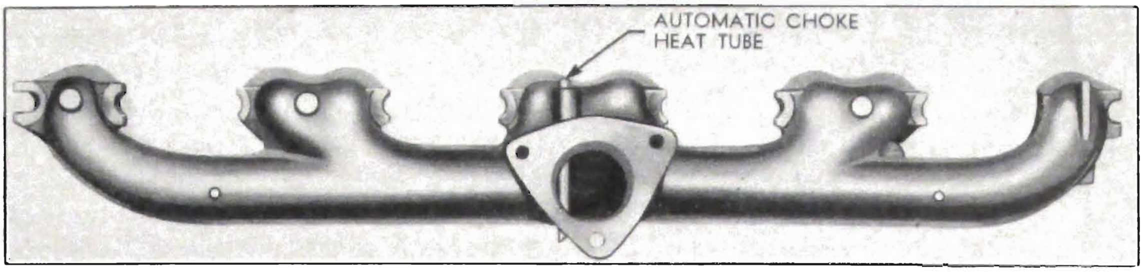


Fig. 6-53. Exhaust Manifold—Series 40

Manifold Gaskets

All intake manifolds use individual gaskets at each leg where connecting with cylinder head. Pilot rings are used to align manifold legs with cylinder head intake ports and to keep gaskets centered.

Exhaust manifolds use no gaskets between manifold and cylinder head. A special compound is used at this point in production. Manifolds may be removed and replaced without using additional compound.

No gasket is used between heat valve section of exhaust manifold and intake manifold. Coat these joints with graphite lubricant when assembled.

When new exhaust manifolds are installed in service, the surfaces contacting the head should be coated with a thin fluid mixture of graphite and engine oil.

Series 40 engines equipped with a single dual carburetor are equipped with an exhaust manifold valve body assembly which is separate from intake and exhaust manifolds. See Fig. 6-52.

A cast-iron pilot ring is provided for lining up exhaust manifold and valve body. During assembly see that ring is properly positioned, otherwise gasket used between exhaust manifold and valve body may leak. A copper ring seals around valve body side of pilot ring.

MANIFOLD ASSEMBLY

All Series

Exhaust and intake manifolds should be assembled to the engine as follows:

1. Assemble exhaust manifold, valve body and intake manifold to engine.

   Tighten bolts sufficient to align all parts but not enough to prevent movement of parts when final tightening is done.
2. Tighten bolts that hold manifolds to cylinder head.
3. Tighten bolts that hold valve body to exhaust manifold. (Single dual carburetor.)
4. Tighten bolts that hold intake manifold to valve body.

HEAT CONTROL

The portion of intake manifolds directly below each carburetor is connected to the exhaust system. The hot gases pass from the exhaust manifold into the heat control valve

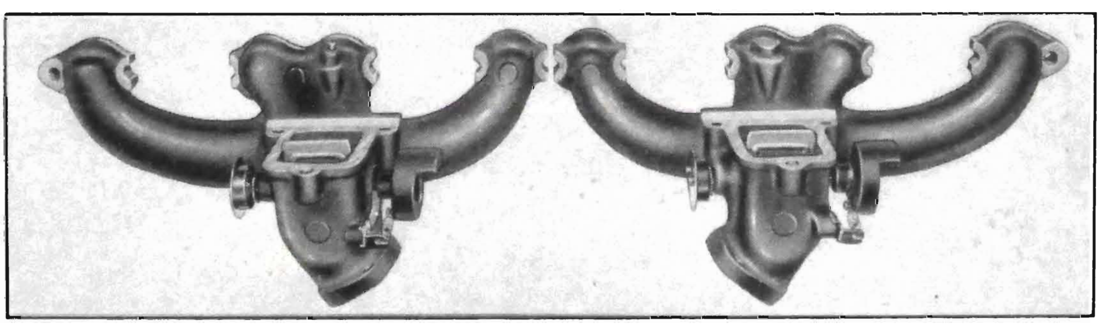


Fig. 6-54. Exhaust Manifold—Compound Carburetion

body where they strike the heat control valve and are deflected upwards into the heat jacket and around the intake manifolds.

The quantity of hot exhaust gases and consequently the amount of heat delivered to the heat jacket is automatically controlled by a thermostat which governs the position of the heat control valve.

The heat control valve is offset, or longer on one side of the valve shaft than on the other, which allows exhaust gas pressure to force the valve open when engine is operating under wide open throttle conditions.

Heat Control Thermostat

The thermostat controlling the heat control valve consists of a bi-metal strip wound so as to form a coil around the valve shaft, with the inner end inserted in a slot in the end of the heat control valve shaft. The outer end of the coil is hooked around an anchor stud in the valve body.

Heat Control Thermostat Adjustment

Setting of the thermostat should be approximately one-quarter turn windup at 70° F., causing tension to be applied to the damper valve, holding it in "heat on" position and forcing exhaust gases through the heat jacket. Heat conducted by the damper valve shaft to the thermostat causes it to unwind, reducing tension on the damper valve which allows the valve to be forced, by the exhaust gas pressure, toward the "*off*" position.

These springs should never be distorted or changed in any way so as to affect calibration. To operate correctly, heat control shafts must operate free. Valves stuck in closed position may cause overheating, warped manifolds, blown gaskets, and hard starting when hot. Valves stuck in open position may cause poor carburetor operation due to lack of manifold heat.

The thermostat is also controlled by temperature of the air blast past side of engine. This makes the heat control vary with outside air temperatures.

Heat Valve Anti-Rattle Spring Adjustment

When the engine is cold, the heat valve is held in closed position by tension of the thermostat spring. See Figs. 6-56 and 6-57.

Spring "A" acts as an anti-rattle device and resists tendency of thermostat spring to throw counterweight "B" to the position where the valve tongue would contact housing on inside of valve body. On single carburetor, Series 40, clip "C" should be adjusted so that spring "A" will prevent control valve from contacting control valve body when valve is in either "fully closed" or "fully opened" position. See Fig. 6-56. Adjustment so that valve is just off seat sufficient in closed position to prevent rattle, will also usually be correct for open position. Both anti-rattle springs must be adjusted on compound carburetor equipped engines. On this

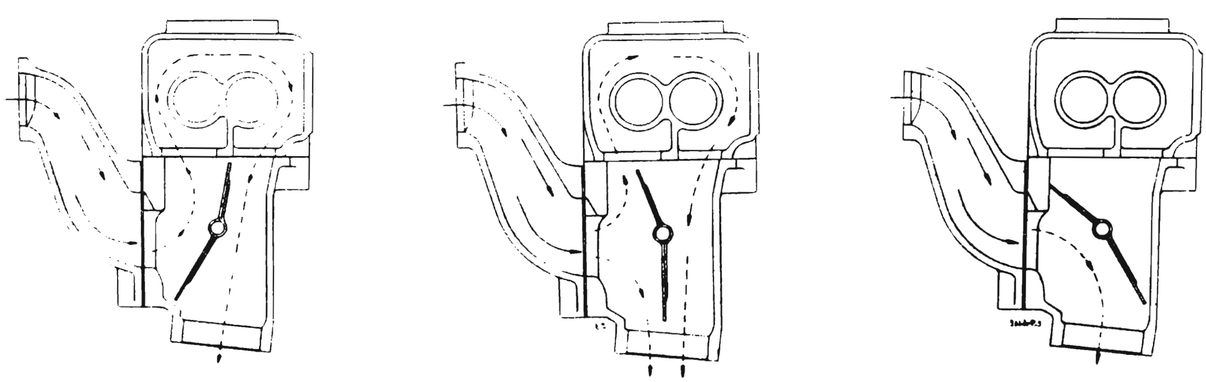


Fig. 6-55. Heat Control Valve Operation

equipment spring "A" should be adjusted so that control valve will prevent rattle when valve is in "fully opened" position. This adjustment will be the only one necessary because valve does not come near seat in closed position. These positions can be felt by moving counterweights by hand. Adjustment can be made regardless of whether engine is hot or cold.

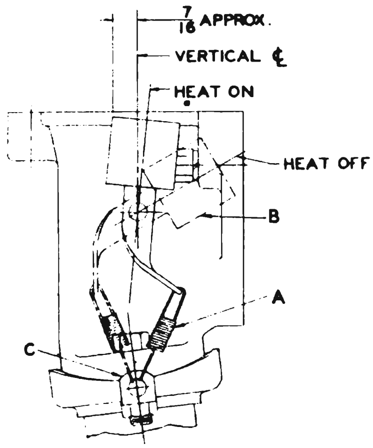


Fig. 6-56. Damper Valve Counterweight Adjustment—Single Carbuertor

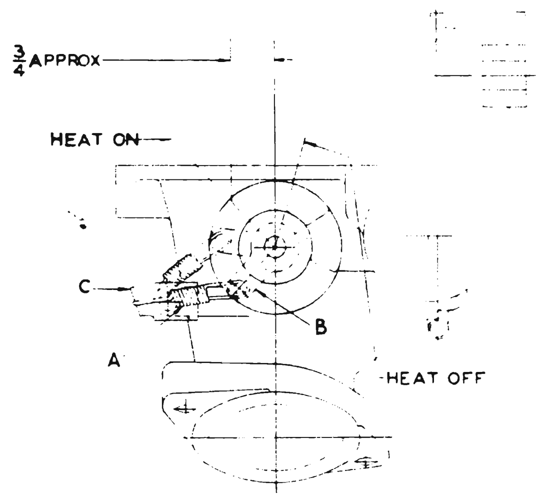


Fig. 6-57. Damper Valve Counterweight Adjustment—Compound Carburetion

CARBURETOR

All Series

Engines are equipped with either Stromberg or Carter Carburetors in production. The equipment on any engine is considered as "standard." It is not intended that these units be interchanged to provide "optional" equipment.

Series 40 engines are equipped as "standard" with one dual carburetor. This series is also available "optionally" equipped with compound carburetion. This means that two dual carburetors are used on one dual manifold.

Series 50-60-70-90 engines are equipped as "standard" with compound carburetion. Single dual equipment is not available on these series.

COMPOUND CARBURETION

Operation

Engines equipped with compound carburetion use two dual carburetors mounted on one dual manifold. See Fig. 6-58.

The outside branch of manifold is connected to outside barrel of both carburetors and feeds cylinders Nos. 1, 2, 7 and 8. See Figs. 6-50, 6-51.

The inside branch of manifold is connected to inside barrel of both carburetors and feeds cylinders Nos. 3, 4, 5 and 6.

This arrangement of carburetors and manifolds makes it possible for either front or rear carburetor to feed to all eight cylinders.

The front carburetor is complete and includes a float system, main metering system, accelerating pump, power by-pass system, idling system, starter switch, and automatic choke. See Figs. 6-66, 6-73.

The rear carburetor contains only a float system, idling system, and main metering system.

When engine is idling and up to approximately 22 M.P.H. part throttle, the idling systems of both carburetors are in operation.

A damper valve assembly is used between rear carburetor and intake manifold. See Fig. 6-59. Except under conditions described below, this valve is held in closed position by an offset weight and serves to govern the operation of the rear carburetor.

The flies in this valve assembly are not a tight fit and for this reason the idling system of rear carburetor will operate with valve in closed position.

The throttle rods and levers are so arranged that the throttle of only the front carburetor is opened until a position is reached which will

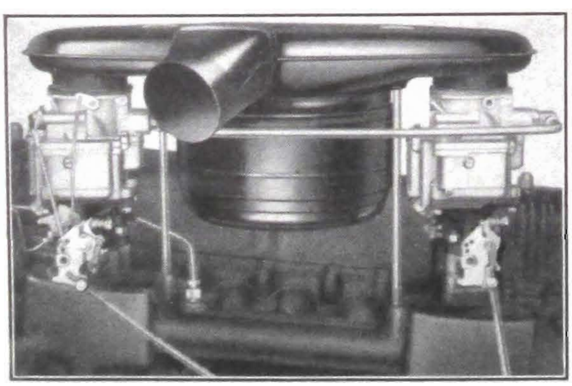


Fig. 6-58. Compound Carburetors

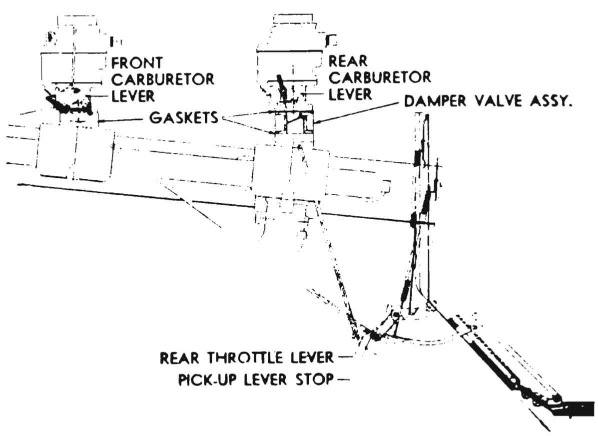


Fig. 6-59. Throttle Linkage Adjustment—Compound Carburetion

give approximately 75 M.P.H. on part throttle. Up to this point of opening only the front carburetor operates except for idle system of rear carburetors as previously described.

Additional movement of accelerator pedal will start to open throttle of rear carburetor. Opening of rear carburetor throttle allows air flow through rear carburetor to open damper valve and bring rear carburetor into operation.

When throttles of both carburetors are fully opened, the front and rear carburetors feed equally.

If accelerator pedal is fully depressed at low speed, only the front carburetor operates until manifold vacuum is sufficient to open flies of damper valve assembly. This will begin to occur at approximately 15 miles per hour.

Gaskets—Carburetor to Manifold
All Series

• A molded insulating fibre gasket is used between the carburetor and intake manifold on all series. This gasket is same on all series because all carburetor flanges are of "three bolt" type as formerly used on Series 40-50 engines.

On engines with a rear carburetor, this heavy gasket is installed between damper valve assembly and manifold. A thin gasket is used between damper valve and rear carburetor. See Fig. 6-59.

AIR INTAKE—COMPOUND CARBURETION

(See "Air Cleaner" Section)

Carburetor Throttle Rod Adjustment

The following adjustments cover both single carburetor and compound carburetion equipment. See Fig. 6-59.

1. Floor mat must be in place because mat serves as stop for "open" position of accelerator pedal.
2. If carburetor is not cold enough to cause de-loader cam to contact carburetor lever as throttle is opened, hold de-loader cam in contact with carburetor.
3. Adjust throttle rod so that carburetor (Front carburetor on compound carburetion equipped engines) lever is in fully opened position when accelerator pedal is depressed to floor mat. De-loader must be in operation to exert normal load on throttle rod when accelerator pedal is depressed.
4. On compound carburetion equipped engines follow above adjustments by adjusting accelerator rod to rear carburetor. This rod is adjusted so that rear carburetor lever is in open position when front carburetor lever is in open position (de-loader working) and accelerator pedal is fully depressed.

Idle Adjustment—*All Series*
Compound Carburetion Equipment

Engine must be warm and set to idle at approximately 8 to 10 M.P.H. in high gear. •

1. Turn off ignition switch.
2. Back off both **throttle adjusting screws** until throttles are fully closed. Ends of adjusting screw should be set to barely contact thin section of cold idle cam on front carburetor, and throttle body on rear carburetor, **when throttles are fully closed.**

   Turn each throttle adjusting screw ¾ turn clockwise to open each throttle same amount.
3. Turn **idle mixture adjusting screws** "in" on both carburetors until closed position can be felt with a screwdriver.

   Do not force screws on seat as this will damage them.

   Open each screw 1 turn.
4. Turn on ignition switch and start engine.

   If either idle speed or idle mixture needs additional adjustment, turn each **throttle adjusting screw** same amount in desired direction, and each **idle mixture screw** same amount in desired direction.

It will be found advantageous to change each **screw** ⅛ turn at a time when adjusting either "idle speed" or "idle mixture."

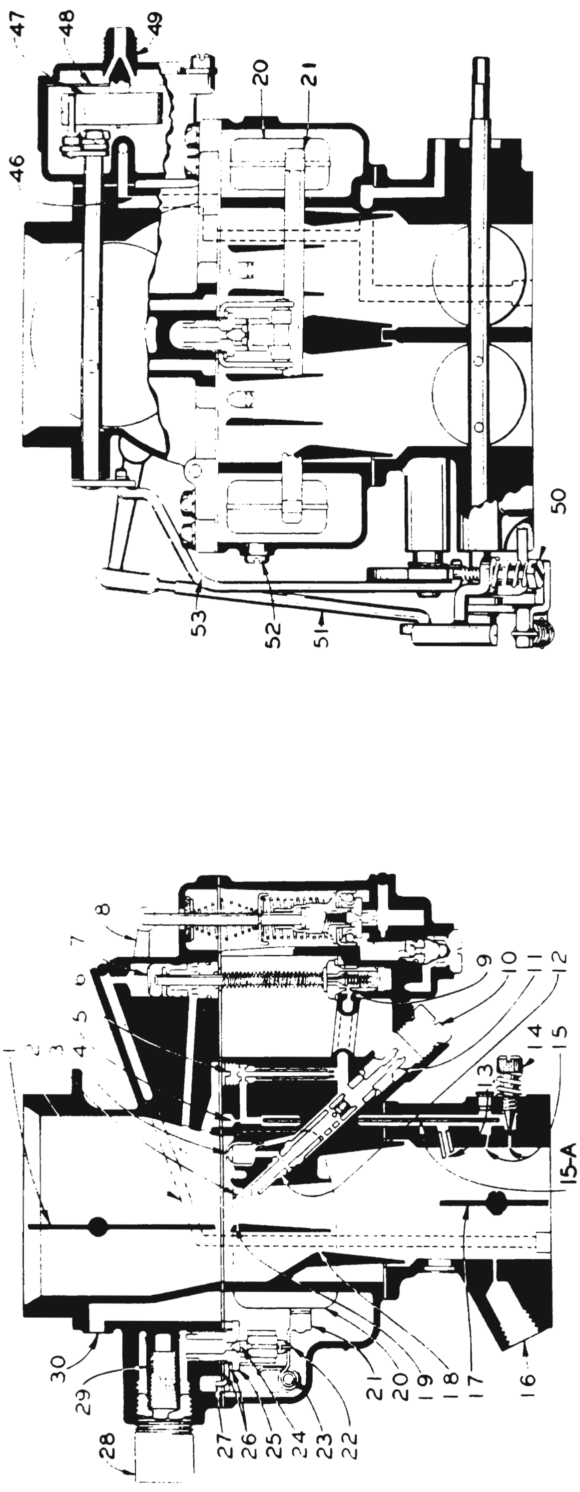


Fig. 6-60. Series 40, Standard Equipment, Single Dual Carburetor

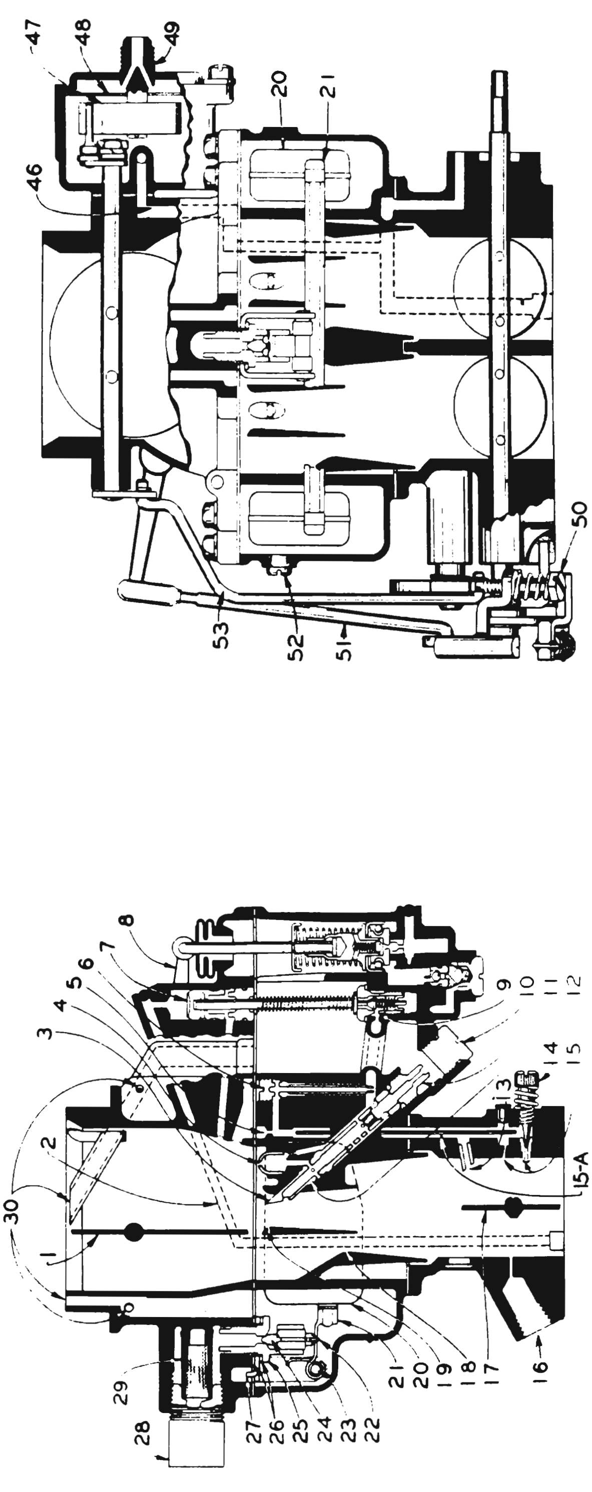


Fig. 6-61. Front Carburetor—All Series—Compound Carburetion Equipment

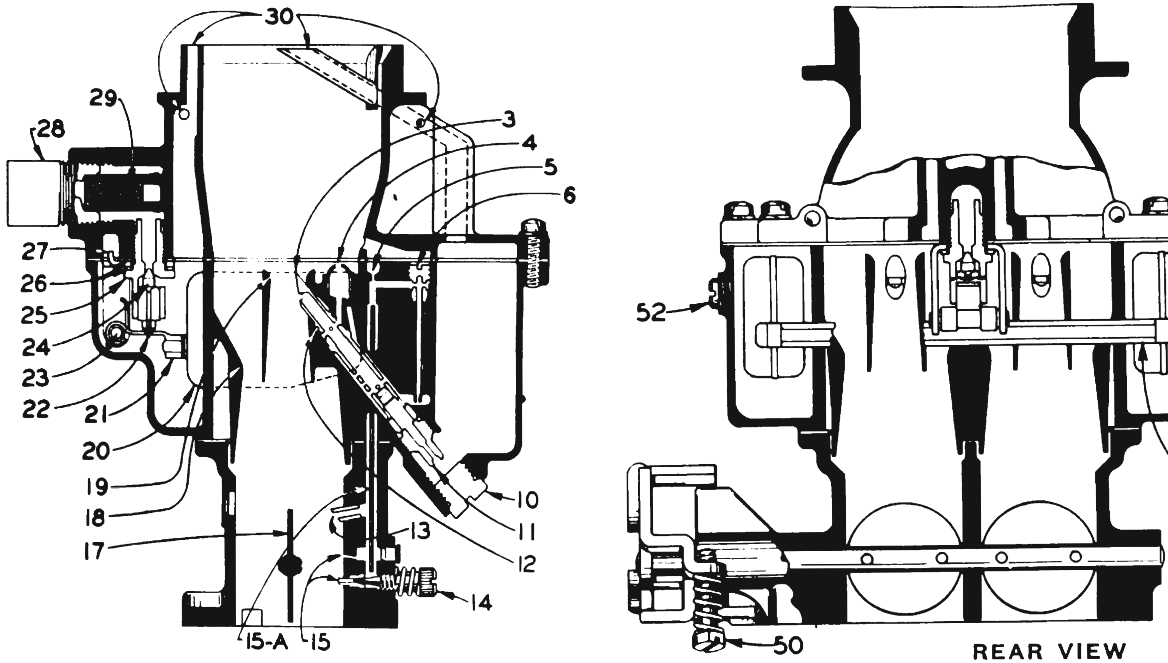


Fig. 6-62. Rear Carburetor—All Series—Compound Carburetion Equipment

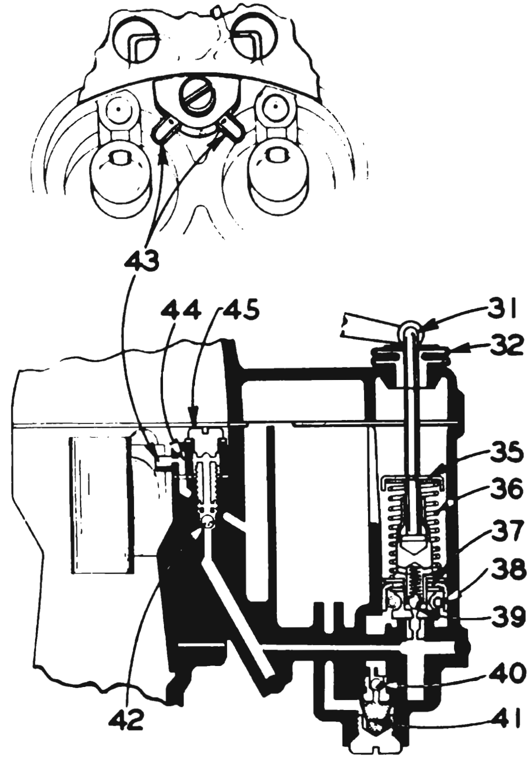


Fig. 6-63. Accelerating Pump—All Series

1. **Choke valve**
2. **Power piston vacuum passage**
3. **Main discharge jet**
4. **High speed bleeder**
5. **Idle air bleeder**
6. **Idle tube**
7. **Vacuum power piston**
8. **Pump fulcrum arm**
9. **Power by-pass jet**
10. **Main discharge jet plug**
11. **Main metering jet**
12. **Main discharge jet lead gasket**
13. **Secondary idle air bleeder**
14. Idle needle valve
15. Idle discharge holes

15A. Idle channel reducer wire

16. Vacuum spark connection
17. Throttle valve
18. Primary venturi
19. Auxiliary venturi
20. Float
21. Float lever
22. Float needle valve clip
23. Float fulcrum pin
24. Float needle valve
25. Float needle valve seat
26. Float hanger gaskets
27. Float hanger
28. Gasoline inlet
29. Gasoline strainer
30. Float chamber vents
31. Pump piston link
32. Felt dust washer (Single dual)
33. Retainer washer (Single dual)
34. Dust washer spring (Single dual)
35. Spring retainer washer
36. Pump duration spring
37. Pump piston
38. Piston expansion spring
39. Pump relief valve
40. Pump inlet check valve
41. Pump inlet strainer
42. Pump outlet check valve
43. Pump discharge nozzles
44. Pump discharge restriction
45. Pump discharge screw
46. Automatic choke vacuum passage
47. Thermostat
48. Screen
49. Hot air tube connection
50. Throttle stop screw
51. Pump rod
52. Fuel level sight plug
53. Fast idle rod

IMPORTANT—When ordering metering jets, main discharge jets or by-pass jets, etc., specify the size required and always state type and code number of carburetor as well as model of car for which part is intended. Code numbers will be found on bowl cover directly over fuel level inspection hole in body.

If vacuum gauge is used, set idle mixture screws so gauge will show 1″ less than maximum reading.

Single Carburetor Equipment

Follow same procedure outlined for compound equipment except that screws in each case will have to be opened slightly more.

Starting Procedure—
For All Carburetor Equipment

1. **When engine is cold:**
   Depress accelerator pedal just far enough to engage starter.
2. **When engine is partially warm, hot or flooded:**
   Depress accelerator to floor and hold until engine fires regularly.

STROMBERG CARBURETOR

STROMBERG CARBURETOR

All Series

Carburetor Identification

The following table shows the various Stromberg Carburetor Models used on all series.

Buick 1942 Series	Carburetor Model	Carburetor Part No.	Carburetor Code No.
Series 40-50 Standard . .	AAV-16	380029	7-37
Series 40 Compound Front Carburetor	AAV-16	380103	7-59
Series 40-50 Compound Rear Carburetor	AA-1	380096	7-56
Ser. 60-70-90 Compound Front Carburetor	AAV-16	380104	7-60
Ser. 60-70-90 Compound Rear Carburetor	AA-1	380095	7-55

The AAV-16 Model, used on Series 40 as standard and as the front carburetor on all compound equipped engines, is a complete carburetor and includes automatic choke, float system, main metering system, accelerating pump, power by-pass system, idling system, and starting switch.

The AA-1 Model used as the rear carburetor on all compound equipped engines, contains only float system, idling system, and main metering systems.

There are slight but important differences between the various carburetors. Even though they are of the same model designation, one must never be interchanged with another.

The AAV-16 for the Standard 40 Series is the same as used in 1940, including external vent to float chamber, and contains the same internal specifications. See Fig. 6-60.

All carburetors, both front and rear, used on compound equipped engines, have balanced float chambers with internal vent. See Figs. 6-61 and 6-62.

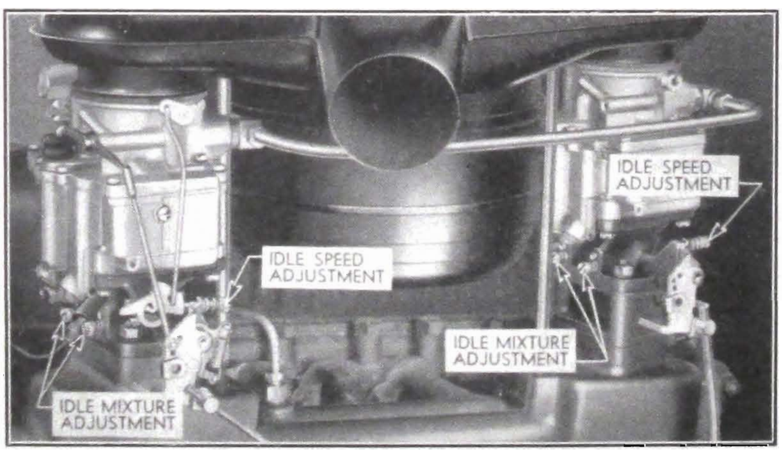


Fig. 6-64. Carburetor Adjustments

AAV-16 carburetors used on these engines have accelerating pump rod seals in the form of synthetic rubber sylphons. See Fig. 6-66.

The single dual carburetor used as standard equipment on Series 40 does not use rubber sylphons on pump. See Fig. 6-60.

Although the carburetors differ somewhat in appearance and internal specifications, the principle of operation in all is the plain tube, using air bled jet to maintain proper mixture throughout the entire range.

General Description

All Series

The following description covers the general operation, but is strictly correct only in connection with the AAV-16 models, since certain features, as described above, have been eliminated from the AA-1 carburetor.

The fuel chamber completely surrounds entire body. This feature enables fuel to be maintained at proper level under various operating conditions. The float needle valve is hooked to float lever. A removable plug for checking position of fuel level is provided. There is a set of venturi tubes, a main metering jet, an idle system with an adjustable needle, throttle valve, and a pump discharge nozzle for each barrel. Both barrels are supplied fuel by one float chamber. There is only one air inlet.

The idling system supplies all the fuel at idling speeds and also on part throttle up to approximately 22 M.P.H. From approximately 22 M.P.H. to 75 M.P.H. part throttle, all of the fuel is supplied through main metering system. The additional fuel necessary for speeds above 75 M.P.H. and on all wide open throttle operations is supplied through the power by-pass valve.

An accelerating pump is connected directly to the throttle. The economizer is controlled by manifold vacuum.

Operation

In the following description, each part is identified with a reference number; for the sake of clearness, this number remains the same for the corresponding part on the various models illustrated. See Figs. 6-60 to 6-63 inclusive.

Main Metering System

Fuel enters the carburetor at gasoline inlet (28), passing through strainer (29), float needle valve and seat (24 and 25), and into the float bowl where it is maintained at constant level by float (20).

Gasoline strainer (29) may be removed by removing gasoline inlet (28). Strainer should be taken out and cleaned whenever carburetor is overhauled.

Air enters carburetor through air inlet and places suction on main discharge jet (3) or idle discharge holes (15) depending on amount of throttle opening. Main metering jets (11) are of fixed type. They control flow of gas during intermediate or part throttle position up to approximately 75 M.P.H. From the metering jet fuel passes into the main discharge jet (3) where it is mixed with air from high speed bleeder (4) and flows into the carburetor barrel to intake manifold.

The jets for the Stromberg Carburetors, whether AAV-16 or AA-1, are all of one type and can be identified by the wide groove cut around the shank of the jet. No other type should be used.

All jets of fixed type are calibrated at the factory to supply correct mixture for normal operating conditions and should not be changed without special instructions from the factory.

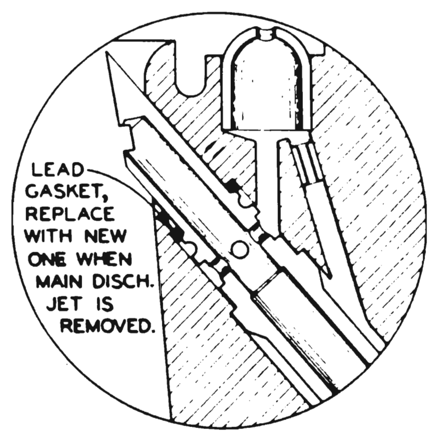


Fig. 6-65. Main Jet Gasket

If test equipment used in service indicates need for different size jets, other causes such as air inlet and air cleaner restriction, improper float level, etc., should be checked. **Do not change jet sizes.** See "Air Inlet."

When servicing the carburetor, and main discharge jets are removed, lead gasket (12) must be replaced by a new one to assure a good seal when main jet is reassembled. See Fig. 6-65.

Maximum Power Operation

For maximum power or high speed running a richer mixture is required than that necessary for normal throttle opening. For part throttle opening, fuel is supplied through main metering jet to approximately 75 M.P.H. In this range the manifold vacuum has sufficient suction to hold vacuum power piston (7) in its *"up"* position. When approximately this speed is reached manifold vacuum decreases so that the vacuum piston spring has a greater force and moves the piston downward to open power by-pass jet (9) to feed additional fuel that is required into the main discharge jet.

Acceleration Operation

For accelerating requirements it is necessary to supply momentarily an extra amount of fuel when throttle is opened. On up stroke of pump piston (37) fuel is drawn into piston chamber through the pump strainer (41) and inlet check valve (40). On down stroke the compression closes the inlet check valve, opens the outlet valve (42) and fuel is then discharged through pump discharge nozzles (43) into each of the carburetor barrels. When the throttle is opened part way only a small amount of fuel is discharged.

Pump strainer (41) is placed in carburetor as a precaution to keep dirt, grit, and fine particles out of the pump system. This strainer should be cleaned at time of carburetor overhaul.

Accelerating Pump Adjustment

Three holes are provided in the carburetor throttle lever for attaching the accelerator pump rod. Rod should be connected in center hole for use with ordinary fuels. Where fuels are used which are high enough in volatility to cause a "staggering" or too rich a charge on acceleration, couple link in hole nearest throttle shaft. Hole nearest throttle shaft affords a shorter accelerating pump stroke.

If carburetor is lean on acceleration the link should be connected in hole farthest from the throttle shaft, which will provide the maximum fuel delivery.

Highly volatile fuels are usually marketed during the winter season, therefore, if pump links are set for shorter stroke, it will be necessary to change back when regular fuels are again generally marketed.

Idle Metering

Fuel for idle speeds is taken through idle tube (6) where it is mixed with air from air bleeder (5).

The mixture passes to the idle channel where additional air is mixed with it through secondary idle air bleeder (13). It is then discharged through idle holes (15). On "curb idle" or closed throttle, fuel is drawn only from lower idle discharge hole due to high suction at this point. As throttle is opened, suction is also placed on upper idle discharge hole to feed additional fuel until throttle is opened to the position where main discharge jet comes into operation.

Fuel Level

Fuel level in float chamber is maintained by float (20). The level is set at the factory at $\frac{1}{3}\frac{8}{2}$" below top surface of the float chamber which corresponds to bottom of threads at inspection hole (52) with engine idling. Plug should be removed to observe position of the level before the carburetor is disassembled to reset float. It is not necessary to reset float unless it has been tampered with or carburetor has been handled roughly. If so, it can be reset by bending float lever arm to give correct level.

Fuel level must be checked only while engine is running.

Carburetor Parts Cabinet

Original parts cabinet complete should be ordered through nearest Authorized Stromberg Distributor, but will be shipped from Bendix Products Division, South Bend, Indiana.

Replacement parts can be reordered from the local or nearest Stromberg authorized distributor.

Stromberg Carburetor Calibrations

Use low altitude calibration for elevation below 3500 feet.

Use high altitude calibration for elevation above 3500 feet.

For cars operating above 9000 feet permanently, use main metering jets .002″ smaller than specified for high altitude.

Series 40 Standard (One Carburetor) AAV-16

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.045″	.042″
By-pass jet	#60	#60
High speed bleeder	#70	#70
Float needle seat	.101″	.101″

Series 40 Compound Equipment Front Carburetor AAV-16

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.041″	.039″
By-pass jet	#60	#60
High speed bleeder	#60	#60
Float needle seat	.093″	.093″

Series 40 Compound Equipment Rear Carburetor AA-1

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.048″	.046″
High speed bleeder	#60	#60
Float needle seat	.078″	.078″

Series 50 Compound Equipment Front Carburetor AAV-16

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.041″	.039″
By-pass jet	#60	#60
High speed bleeder	#60	#60
Float needle seat	.093″	.093″

Series 50 Compound Equipment Rear Carburetor AA-1

Heavy Duty Air Cleaner	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.048″	.046″
High speed bleeder	#60	#60
Float needle seat	.078″	.078″

Series 60-70-90 Compound Equipment Front Carburetor AAV-16

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.047″	.045″
By-pass jet	#56	#56
High speed bleeder	#65	#65
Float needle seat	.093″	.093″

Series 60-70-90 Compound Equipment Rear Carburetor AA-1

	Low Altitude	High Altitude
Main discharge jet	#32-28	#32-28
Main metering jet	.053″	.051″
High speed bleeder	#65	#65
Float needle seat	.078″	.078″

Stromberg Carburetor Tools

Special tools necessary for servicing Stromberg carburetors and Stromberg chokes may be obtained from Hinckley-Myers.

KMO-269-S ....Carburetor Tool Set for Stromberg Carburetors

Consisting of:

KMO-269-S-1...Jet Puller EE1 Carburetor

KMO-269-S-2...Main Metering Jet Wrench

KMO-269-S-3...Main Metering Jet Wrench Handle

KMO-269-S-4...Main Discharge Jet Remover

KMO-269-S-5...Spanner Wrench for Vacuum Economizer Piston

KMO-269-S-7...Float Gauge

KMO-269-S-8...Screwdriver for Main Jet Plugs

KMO-269-S-9...Choke Gauge

KMO-269-S-10..Choke Setting Socket Wrench

KMO-269-S-11..Choke Valve Step Gauge

STROMBERG CHOKE CONTROL

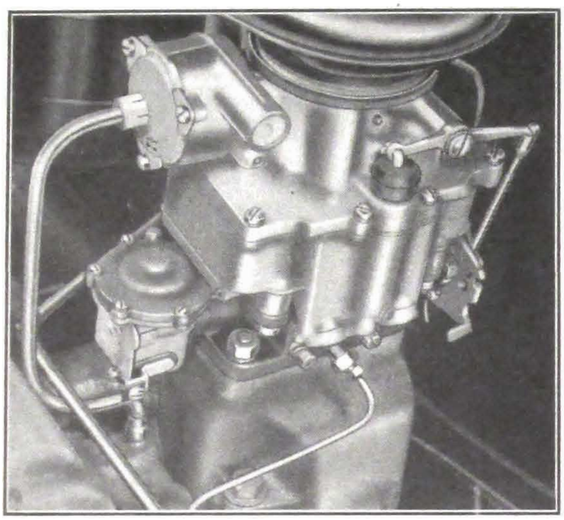


Fig. 6-66. Choke—Stromberg Carburetor

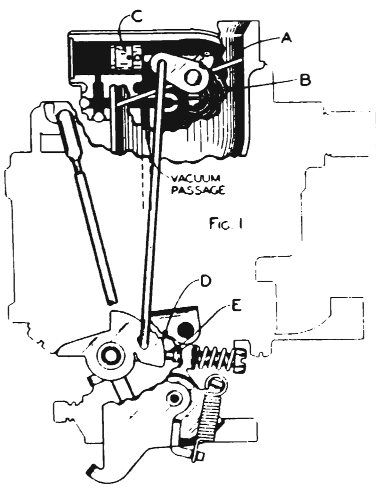
OPERATION AND ADJUSTMENTS

Rear carburetor on engines equipped with compound carburetion are not equipped with either automatic choke or choke fly. The rear carburetor throttle and damper valve assembly are closed during normal starting operations. For this reason all choking is done on the front carburetor.

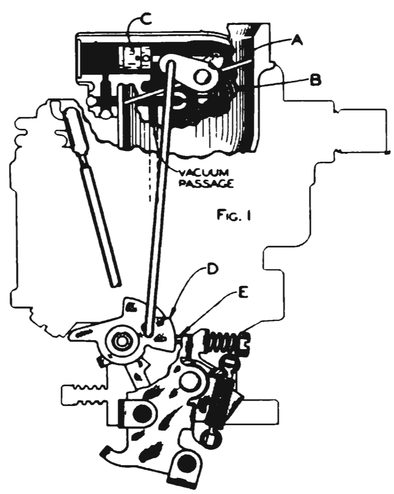
The automatic choke control is built into a housing integral with the carburetor. The principles used in the operation of the automatic choke are manifold vacuum, thermostat spring, and an offset choke valve in the carburetor. The vacuum piston and thermostat are directly connected to carburetor choke valve and accurately control opening and closing of choke valve under varying operating temperatures and at various throttle positions. A tube leading from the exhaust manifold to the thermostat chamber transmits heat to govern tension of thermostat spring. A fast idle cam operating in conjunction with automatic choke provides proper throttle opening for a cold engine and thereby prevents engine from stalling during warming-up period.

Cold Engine

When the engine becomes cold, thermostat also cools and gradually gains sufficient tension to partially close the choke valve "A." As soon as accelerator pedal is depressed to start engine, the throttle is partially opened so that throttle stop screw "E" is lifted away from fast idle cam "D." This permits choke valve to close in accordance with thermostat tension. See Fig. 6-67. Throttle stop screw then comes to rest

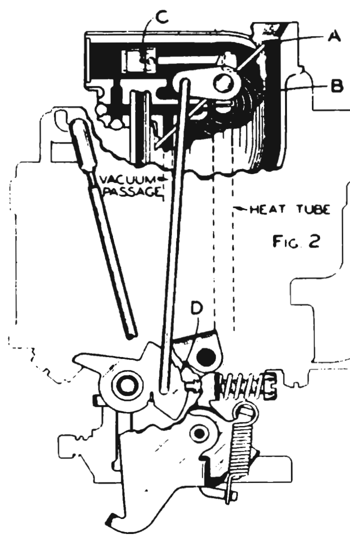


Single Carburetor—Series 40

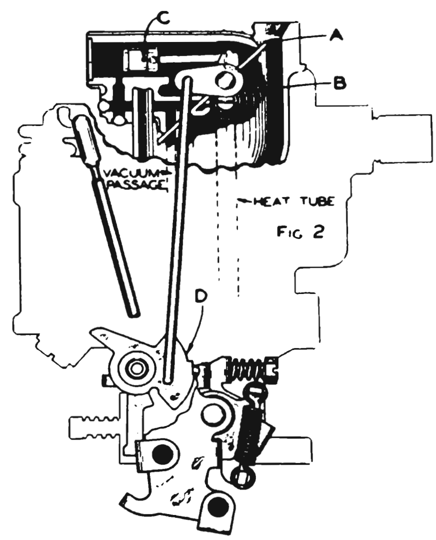


Compound Carburetion—All Series

Fig. 6-67. Cold Engine Position



Single Carburetor—Series 40



Compound Carburetion—All Series

Fig. 6-68. Warm-Up Position

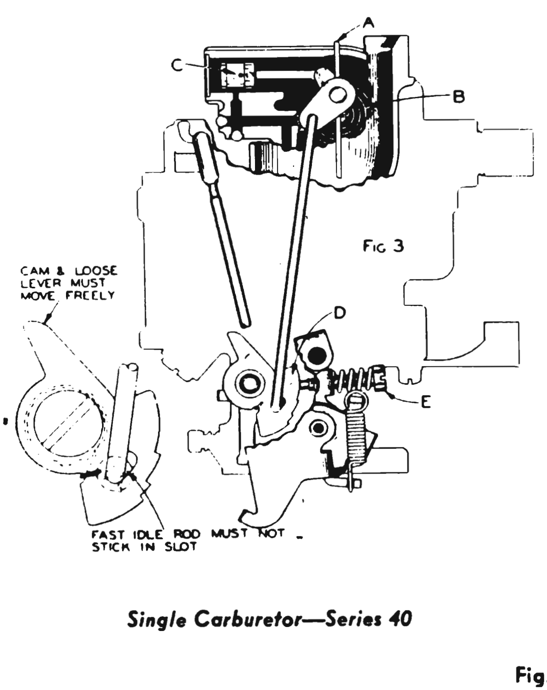
on a higher lobe of fast idle cam after engine is running, providing proper throttle opening for prevailing engine temperature. Choke valve "A" is held in closed position during this operation by tension of thermostat "B."

Warming-Up Period

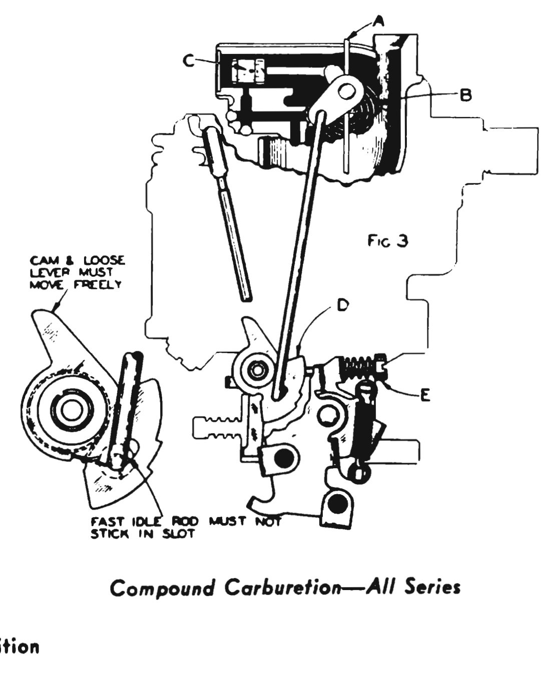
When engine begins to fire, manifold vacuum pulls vacuum piston "C" opening choke valve "A" against tension of thermostat spring "B." Sufficient air is thereby admitted to give a satisfactory running mixture. See Fig. 6-68. As choke valve opening is increased, fast idle cam is allowed to revolve so that throttle stop screw comes to rest on a lower step when throttle is opened and then permitted to close.

Warm Engine

While the engine continues to run, the inrushing air forces the off-center choke valve "A" open. The amount choke valve opens is controlled by vacuum piston and tension of thermo-

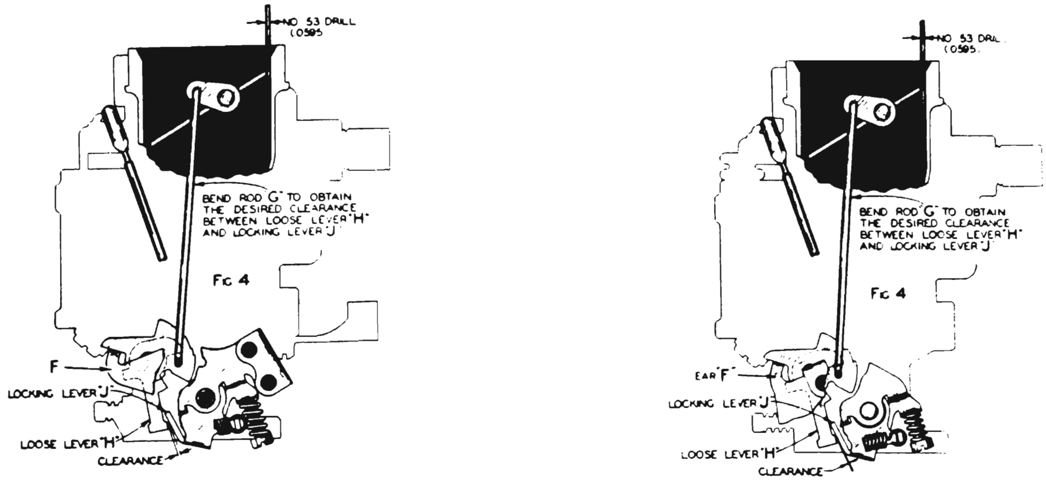


Single Carburetor—Series 40



Compound Carburetion—All Series

Fig. 6-69. Hot Position



Single Carburetor—Series 40 *Compound Carburetion—All Series*

Fig. 6-70. Choke Release Setting

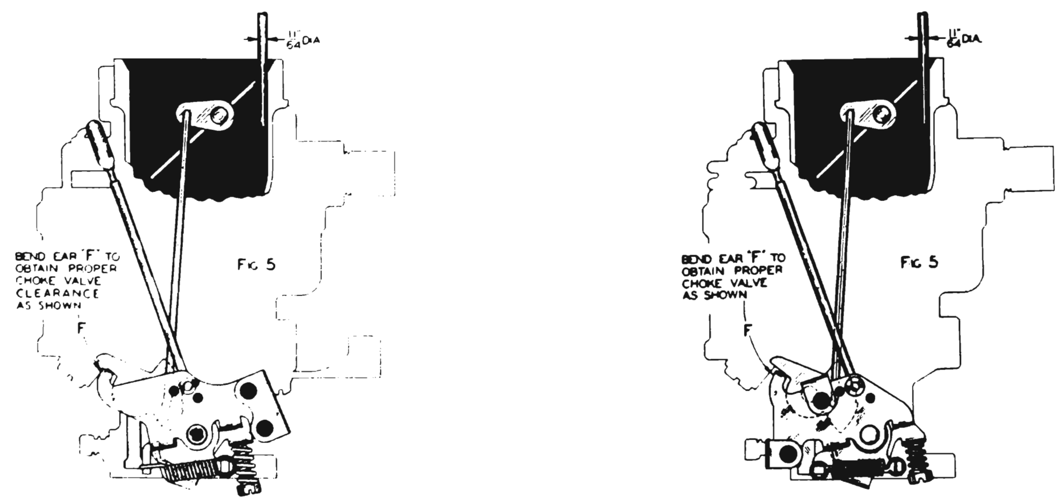
stat. Heat is transmitted into the thermostat chamber by hot air being drawn from a tube extending through exhaust manifold. See Fig. 6-69. The thermostat gradually absorbs sufficient heat so that its tension decreases until it does not offer any further resistance to choke valve opening. At the same time the fast idle cam "D" rotates until throttle stop screw is at normal idle position.

Choke Release

If for any reason engine should become flooded, choke valve can be partially opened by depressing accelerator pedal to the full extent of its travel. This results in ear "F" of the throttle lever making contact with fast idle cam, rotating it, and forcing choke valve open.

When checking the choke release mechanism, fast idle cam setting is automatically obtained. The procedure is to hold a #53 drill between the choke valve and the air horn. See **Fig. 6-70.**

In this position, locking lever "J" should just clear loose lever "H" while the throttle is opened and closed. To obtain the desired clearance, bent the fast idle rod at the point indicated. Care should be taken so as not to distort the fast idle



Single Carburetor—Series 40 *Compound Carburetion—All Series*

Fig. 6-71. Choke Deloader

cam return spring or cause a bind between the rod and the slot in the cam.

With throttle in wide open position, the space between top of valve and air horn should be between .156" and .187". This can be measured by placing a drill of $\frac{11}{64}$" diameter between the valve and air horn. See Fig. 6-71. This setting is properly made at the factory; however, if it is necessary to readjust it, it can be done by bending ear "F" to the desired position. Care should be taken to make certain that the fast idle rod does not bind and fast idle cam spring is not distorted.

Disassembly

1. Remove carburetor from manifold.
2. Remove thermostat cover screws and lug washers. Thermostat cover assembly can then be taken off of the choke housing. See Fig. 6-72.
3. Loosen locknut, removing lockwasher and serrated washer.
4. Remove the vacuum piston assembly from housing.
5. Remove plug.
6. With a clean rag saturated with Acetone or alcohol, thoroughly clean the cylinder walls of any dirt or other foreign material which may have accumulated in regular service. Use compressed air to blow out all of the channels. Surface of piston should also be thoroughly cleaned. Do not use any abrasive materials for cleaning piston or cylinder.
7. Thoroughly clean screen on the inside of cover by blowing compressed air into heat tube connection, and also between screen and cover, using caution not to distort the screen.

Assembly

1. Place vacuum piston in cylinder with slot on piston assembled *down.* **This is very important. Also do not use any type of lubricant on piston or in the cylinder.** Assemble lever onto choke stem. Next assemble serrated washer, lockwasher, and locknut, fastening the nut finger tight. See Fig. 6-72.
   Use vacuum piston setting gauge, T-25046, to position piston in the assembly. Mark on tool must be held in alignment with projection on choke housing.
2. Holding choke valve against $\frac{15}{64}$" drill for the AAV-16 on Standard Series 40, or a #5 drill for the AAV-16 on Series 50-60-70-90 between the choke valve and the air horn. Tighten locknut lightly with Tool T-25047.
3. Remove drill and tool T-25046. Hold choke valve in closed position and tighten locknut securely. Check choke valve opening to be certain the setting was not disturbed.

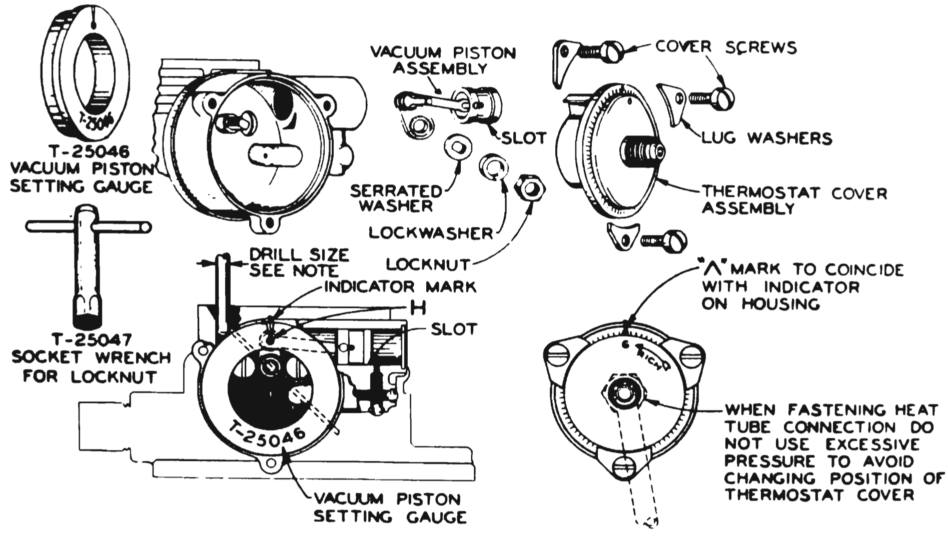


Fig. 6-72. Choke Control, Disassembled

Thermostat Setting

The thermostat is calibrated and properly set at the factory to give satisfactory performance with the regular blends of gasoline. When placing thermostat cover assembly on the housing, use precaution that edge of the screen is not crimped or creased to cause a leak. Locate the thermostat hook at bottom of housing and then rotate cover in "*rich*" direction until "V" mark coincides with projection on housing. This is correct for the thermostat spring setting on compound carburetion equipped engines. On the single carburetor equipped engines on Series 40-50 the setting is one notch lean. Place lugs in position and fasten cover screws securely.

The numeral "6" is stamped on the face of the thermostat cover to distinguish them from the covers used on models earlier than 1940. Do not interchange.

When assembling heat tube connection nut onto thermostat cover do not use excessive pressure. Otherwise position of the cover will be changed.

CARTER CARBURETER

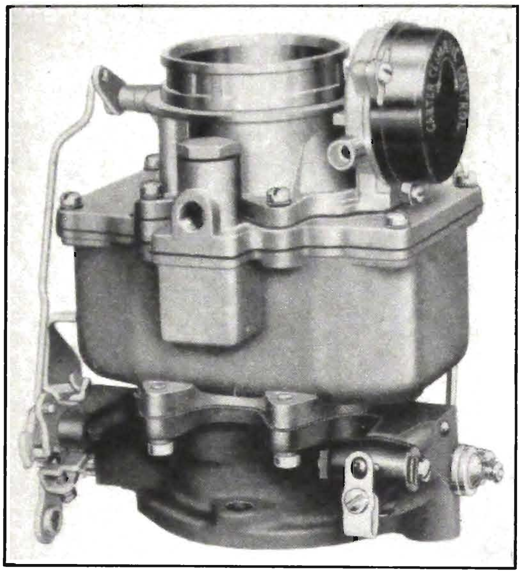


Fig. 6-73. Single Carburetor—Standard Series 40

All Series

Carbureter Indentification

The following table shows the various Carter Carbureter models used on all series:

Series		Carbureter Model
40	"Standard"	487S
40	Compound (Optional) Front Carbureter	528S
40	Compound (Optional) Rear Carbureter	529S
50	Compound Front Carbureter	528S
50	Compound Rear Carbureter	529S
60-70-90	Compound Front Carbureter	533S
60-70-90	Compound Rear Carbureter	534S

Models 487S, 528S, and 533S are complete carbureters and include climatic control, automatic choke circuit, float circuit, intermediate and high speed circuit, accelerating pump circuit, idling and low speed circuit, and starting switch circuit.

The 529S and 534S models used as the rear carbureter on compound equipped engines, shown above, do not have a pump circuit, a choke circuit or metering rods.

There are slight but important differences between the various carbureters. One must never be interchanged with another.

All carbureters, both front and rear, used on compound equipped engines, have balanced float chambers with internal vent.

Although the carbureters differ somewhat in appearance and internal specifications, the principle of operation in all is the plain tube, using air bled jet to maintain proper mixture throughout the entire range.

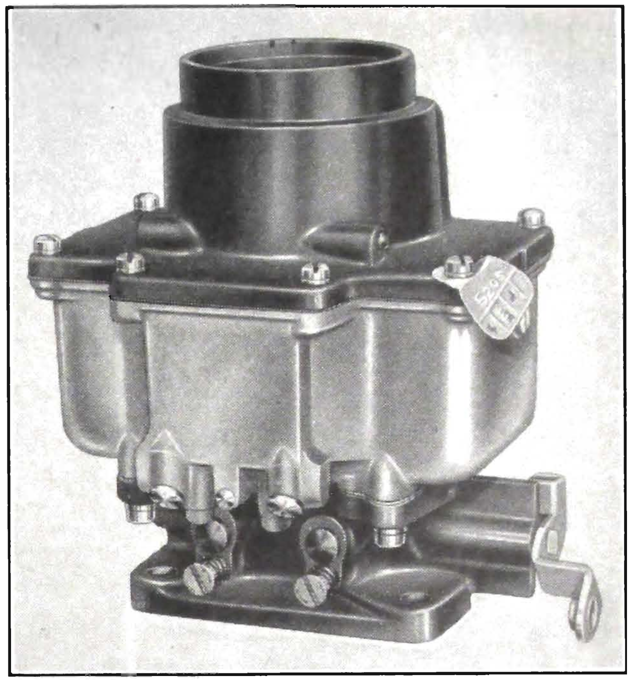


Fig. 6-74. Rear Carburetor—Compound Equipment

The following description covers the general operation, but is strictly correct only in connection with the 487S, 528S and 533S models, since certain features, as described above, have been eliminated from the 529S and 534S carbureters.

Float Circuit

The float circuit controls height of the gasoline level in bowl and also in nozzle. A gasoline level too high or too low will cause trouble in other circuits. See Fig. 6-75.

The float circuit consists of gasoline pressure

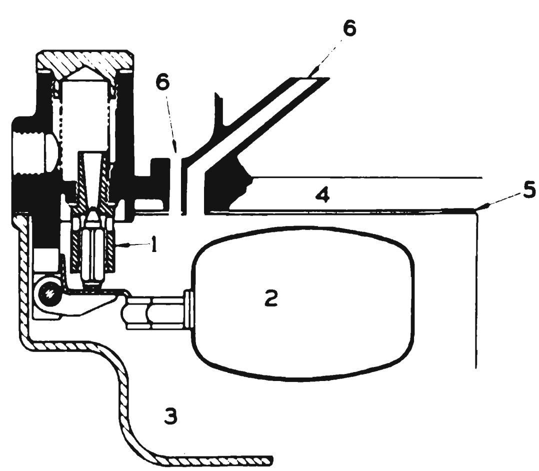


Fig. 6-75. The Float Circuit

(fuel pump), needle valve, seat and gasket (1), floats (2), float bowl (3), float bowl cover (4), bowl cover gasket (5), and vent-hole (6).

Two separate float adjustments must be made —lateral and vertical—when correcting level.

Lateral (side clearance) adjustment is made with bowl cover assembly inverted and needle seated. Sight directly down on each float. The sides of the float must be aligned with the small indicator bosses cast in the bowl cover. Adjustment can be made by bending the float arm at "X." Never bend the float itself. See Fig. 6-76.

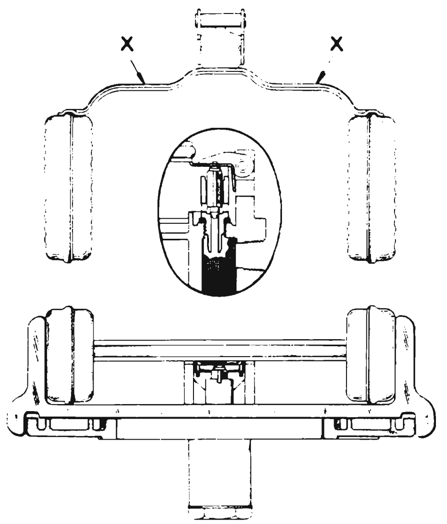


Fig. 6-76. Float Adjustment

Vertical adjustment is made with bowl cover inverted as before, and with bowl cover gasket removed. The distance between the machined surface of casting and each float seam would be $\frac{3}{16}$". Use Carter gauge, T109-162. Both floats must be adjusted alike. Make any necessary adjustments by bending at "X."

Carefully remove float, install bowl cover gasket, and then re-install float.

If the float is loaded with gasoline, is damaged, or if the holes for the float pin are worn out-of-round, replace the unit.

If needle is worn or damaged to extent that flooding occurs, it must be replaced. These are sold in matched pairs in sealed packages. Never replace a needle without replacing the seat.

Fuel pump pressure must be correct. Regardless of the height of the float, the height of the liquid in the float bowl rises as the fuel pump pressure is increased. See "Fuel Pump Pressure."

The Low Speed Circuit

The idle and low speed circuit consists of the low speed jet (7), by-pass (8), economizer (9), air bleed (10), port opening (11), idle adjustment screw (12), throttle valve (13). See Fig. 6-77.

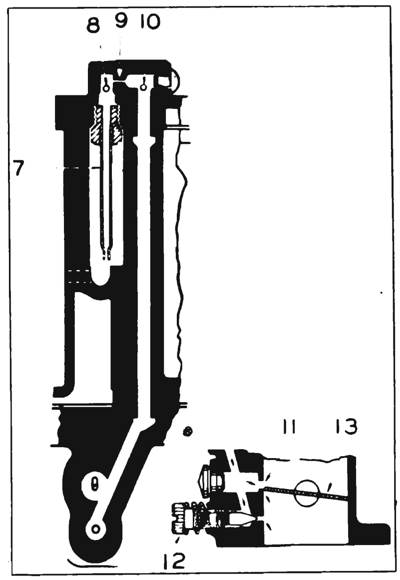


Fig. 6-77. Low Speed Circuit

This circuit controls the supply of gasoline to engine during idle and light-load speeds up to 20 M.P.H., and it partially controls the supply for light-load speeds between 20 and 30 M.P.H.

During idling and low speed operation of the engine, gasoline flows from float bowl through idle speed jet to the point where it is combined with a stream of air coming in from the carbureter throat through the by-pass. The combining of the stream of air with the stream of gasoline tends to atomize or break up the gasoline into a vapor.

This mixture of air and gasoline continues on through the economizer and is further combined with a stream of air coming in through the air bleed. This, again, tends to break the gasoline particles into a finer vapor. The gasoline and air mixture that flows downward in the passage from the air bleed is still richer than an idle mixture needs to be, but when it mixes with the air which has come past the throttle valve, it forms a combustible mixture of the right proportions for idle speed.

The idle port is made slotted so that as throttle valve is opened, it will not only allow more air to come in past it, but will also uncover more of idle port, allowing a greater quantity of the gasoline and air mixture to enter the carbureter throat from the idle mixture passage.

The idle position of the throttle is such that at an idle speed of 8 to 10 M.P.H., it leaves enough of the slotted port in reserve to cover the range in speed between idle and the time when the high speed system begins to operate.

The idle adjustment screw varies the quality of the idle mixture.

All the gasoline flowing from the float bowl during the idle period and at no-load speeds up to 20 M.P.H., flows through the small metering hole in the low speed jet. It should never be cleaned out in any way but by compressed air, as small wires and drills tend to increase the size of the hole.

If the metering hole in the end of the jet is too large because of improper cleaning, or is clogged so that it cannot be cleaned with compressed air, the jet should be replaced.

The black carbon deposit which forms in throats of carbureters may restrict air bleed holes to extent that insufficient air will be supplied to mix with the gasoline before it reaches idle port.

This condition will generally be indicated by having to screw the idle adjusting screw in closer than the minimum limit. If the condition is bad, a "loping" idle may continue even after the idle adjusting screw is screwed entirely in against the seat. These air bleed holes may be cleaned with proper drills.

The idle mixture passage may be restricted. This condition may be found as the cause of an unsteady idle. The passage should be cleaned by removing the aluminum plugs from carbureter body and using a wire and compressed air.

Idle port must be clean and unrestricted.

Idle adjustment screw must be smooth and free of burrs. Spring must have proper tension to hold adjustment.

Throttle valves are made with two opposite edges beveled so as to fit the carbureter throat when valve is closed.

When valves are assembled at the factory, valve screws are clinched over and it may be necessary to file the ends to remove. When using new screws it is not necessary to clinch them again.

A capital "C" enclosed in a circle is stamped on face of the throttle valve. When installed in carbureter, the "C" should be on side of valve toward idle port, and facing manifold.

To properly center valve in throat of carbureter, back out throttle lever adjusting screw so that it does not contact its seat. Start valve screws into shaft, and with valve seated tight, tap valve on upper side. This will centralize valve in carbureter throat. Pressure should then be maintained with finger until screws are tightened.

Carbureter bores which may be restricted with a carbon deposit will make it necessary to open the throttle wider than the specified opening to obtain the proper idle speed. This will uncover more of the slotted idle port than was intended. This will result in leaving an insufficient amount of the idle port in reserve to cover the period between idle and 20 M. P. H. when the high speed system begins to cut in. A flat spot will be the result. Clean by scraping.

To adjust idle, see "Idle Adjustment."

The High Speed Circuit

The intermediate and high speed circuit consists of the metering rod (15), metering rod jet (16), nozzle (17), anti-percolator (18), arm assembly (19), vacuum piston and link assembly (20), vacuum piston spring (21). See Fig. 6-78.

As the throttle is opened wide enough for a part throttle speed of slightly over 20 M.P.H., the velocity of the air flowing down through the carbureter throat creates a pressure slightly less than atmospheric at the tip of the main nozzle.

Since the gasoline in the float bowl is acted upon by atmospheric pressure, the difference in pressure between the two points causes gasoline to flow from the bowl, through the metering jet, and out the main nozzle into the throat of the carbureter.

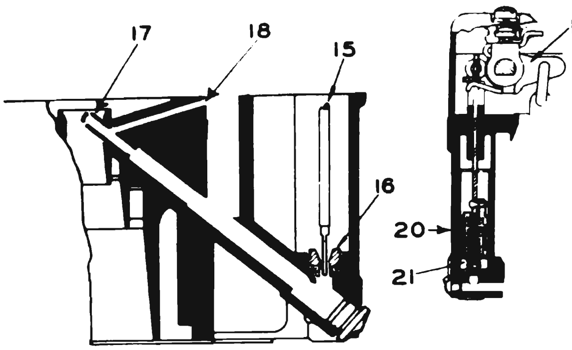


Fig. 6-78. High Speed Circuit

As the speed increases from 20 M.P.H., the high speed system continues to cut in more and more and the idle or low speed circuit to cut out until the high speed circuit is carrying the entire load and the idle system is doing nothing.

At higher speeds, the area of the opening between the jet and the metering rod governs the amount of gasoline going into the engine. At top speed, the smallest section of the rod is in the jet.

Engines operated at part throttle on level road use a mixture of maximum leanness. The mixture for greatest power and acceleration is somewhat richer.

Under part throttle acceleration and for hard pulling at part throttle, the power mixture is required for a short time. The carbureter meets this demand by allowing the drop in manifold vacuum to permit a spring to move the metering rod to the proper step and give the required richer mixture the instant it is required, independent of the throttle opening. As soon as the demand is passed, manifold vacuum moves the vacuum piston link down against a tongue attached to the pump arm and it is then controlled mechanically until another such demand arises.

The control consists of a small brass piston beneath which is a spring fitted into a cylinder. The lower end of the cylinder has a drilled passage opening into the carbureter throat below the throttle valve. The vacuum acting upon the piston through this passage holds the piston down and compresses the spring as long as the vacuum is stronger than the spring. The spring under the piston is calibrated to force the piston up to a carefully determined point (not the top of the cylinder) when manifold vacuum drops below 3 inches of mercury. This spring varies in length for different carbureters and the correct spring must be used. It should never be altered. With the manifold vacuum above 3 inches of mercury, the piston is pulled down until the arm on piston link rests on the tongue attached to the pump arm. When the piston is down this tongue lifts the metering rod in direct ratio to the throttle opening without regard to vacuum.

Main nozzle may be restricted, have the hole too large at the end, or have a leak at the seat. A restricted jet will give poor engine performance above 20 M.P.H. If the hole is too large, gasoline consumption will be increased above 20 M.P.H. If there is a leak at the seat, the results will be a "loping" idle and poor performance at all speeds. A nozzle cannot be removed.

If the carbureter has seen much service or has been tampered with, you may find a metering rod improperly adjusted, worn, or the wrong metering rod installed. A worn metering rod will have the same effect as a metering rod that is too small. In any case, a new metering rod of the correct number must be used. To determine if the metering rod is worn, it may be measured with a micrometer at different steps. If the metering rod is worn, the metering rod jet will also be worn and both should be replaced.

A metering rod too rich (small) will give poor gasoline economy at all speeds above 20 M.P.H. If the metering rod linkage is adjusted too high, it will affect gasoline mileage at all speeds above 20 M. P. H. Changing the adjustment of a metering rod $\frac{1}{64}$" will definitely affect gasoline economy.

Vacuum piston and link assembly must move freely in its cylinder. A sticking piston will cause a rich mixture and must be cleaned or replaced.

Metering rod position should be checked when carbureters are serviced or when leaner than standard rods are installed.

Metering Rod Adjustment

Back out throttle lever adjusting screw so that the throttle valves seat tight. Remove the metering rod and insert one metering rod gauge, T109-152, in place of metering rod. Press down lightly on vacuum piston link at "A." The round shaft "B" should then rest on shoulder of notch in gauge, with not more than .005" clearance. Fig. 6-79.

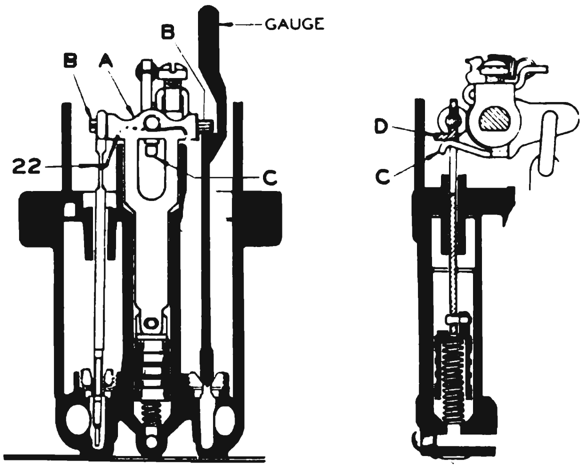


Fig. 6-79. Metering Rod Gauging

Adjustment can be made by bending the lip "C" on pump arm until correct adjustment is obtained. "C" should just touch "D."

Pump or Acceleration Circuit

The pump circuit consists of the pump cylinder (23), pump plunger and rod assembly (24), pump spring (25), pump arm assembly (19), pump connector link (26), intake valve (29), discharge valve (30), pump strainer screen (31), pump jet (32). See Fig. 6-80.

As the accelerator pedal is depressed, the pump plunger is forced downward. This forces the gasoline to leave the cylinder, closes the intake valve, opens the discharge valve, and discharges gasoline into the throat of the carbureter through the pump jet.

The discharge is prolonged by the pressure of the pump arm spring. The prolonging of the discharge gives the gasoline in the high speed system sufficient time to begin flowing fast enough to satisfy the demands of the engine.

As the accelerator pedal is allowed to return to its original position, the accelerating pump plunger is lifted upward by the link. This draws in a charge of gasoline.

If the inlet valve leaks, part of the discharge of the accelerating pump will be forced back into float chamber. A worn ball must be replaced.

If pump discharge valve leaks, air will be drawn into the pump cylinder on the up stroke of the pump and cause a flat spot. If valve is worn, replace.

In pump outlet circuit there is provided a relief valve (28) to protect against high pressures when accelerating.

When the pump leather leaks or spring is damaged the plunger assembly must be replaced.

If pump arm spring is damaged or stuck a stumble on acceleration will result.

A restriction of ball check strainer screen (gauze) will cause a small charge to be drawn into the pump cylinder causing a flat spot. The screen can generally be cleaned, but if damaged it should be replaced.

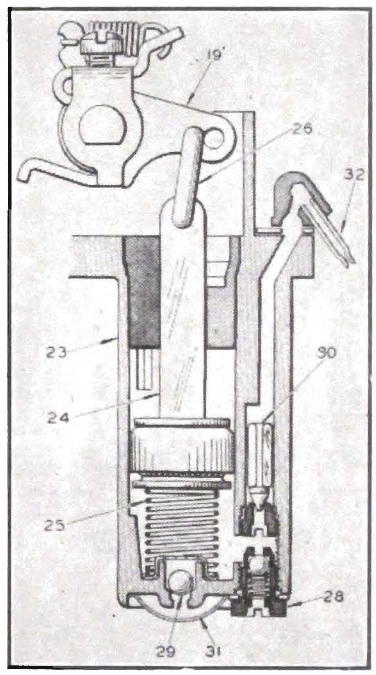


Fig. 6-80. Pump Circuit

Accelerator pump linkage which may be worn will cause the throttle valve to be opened before the accelerating pump jet begins to discharge gasoline, resulting in a flat spot. Replace all worn parts.

Two holes are provided in the pump arm (19) for attaching pump connector link (26). Link should be connected in outer hole for use with ordinary fuels. Where fuels are used which are high enough in volatility to cause a "staggering" or too rich a charge on acceleration, couple link in inner hole.

Pump Adjustment

With connector link in outer hole of pump arm and throttle adjustment screw backed out, the pump plunger should travel ¼″ from closed to wide open throttle position. The pump plunger should travel $\frac{7}{32}$″ with connector link in inner hole in pump arm. Place body of gauge T109-117S inverted, on edge of casting surrounding the pump and metering rod. See Fig. 6-81.

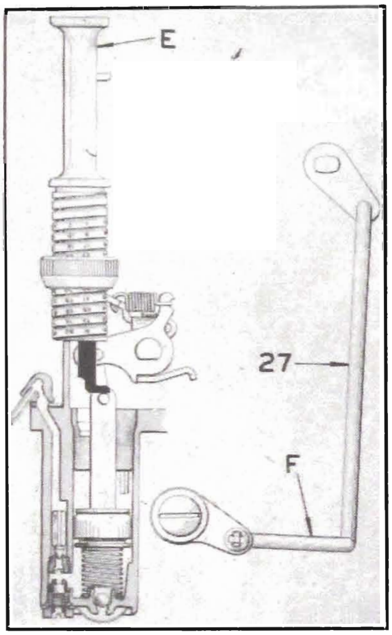


Fig. 6-81. Use of Pump Travel Gauge

Take gauge reading with the gauge resting on upper surface of the lower end of the connector link at the plunger shaft.

The difference in readings on the gauge at wide open and at closed throttle positions indicates the length of pump stroke. The gauge is calibrated in 64ths of an inch. Adjustment can be made by bending the throttle connector rod at the lower angle "F."

CARTER CHOKE (CLIMATIC CONTROL)

When engine is cold the tension of thermostatic choke spring (34) holds choke piston (35) at the top of its travel and choke valve completely closed. This supplies the engine with a rich mixture for starting. See Fig. 6-82.

When engine starts, the vacuum of intake manifold acting upon choke piston and the unbalanced choke valve, partially opens choke valve until it assumes the position where tension of thermostatic choke spring is balanced by pull of vacuum on piston and valve.

As engine warms up slots in sides of choke piston cylinder allow vacuum of intake manifold to draw warm air from tube (36) extending through exhaust manifold, past thermostatic spring (34) and into intake manifold.

This flow of warm air heats thermostatic spring and causes it to decrease its tension. The pull of vacuum on piston working against the decreasing tension of the spring, gradually opens choke until it is fully open when engine is warm enough to run on regular idle mixture.

If, during warm-up period, the engine is accelerated, corresponding drop off in vacuum, which automatically comes with acceleration, allows the thermostatic spring to momentarily partially close the choke, providing engine with a mixture rich enough for acceleration.

During warm-up period, it is necessary to run engine at approximately 12 to 15 M.P.H., part throttle speed to keep it from stalling. This is accomplished by having high spot on fast idle cam come under the idle speed adjusting screw, holding the throttle open sufficiently to provide the necessary engine speed. This is called the fast idle.

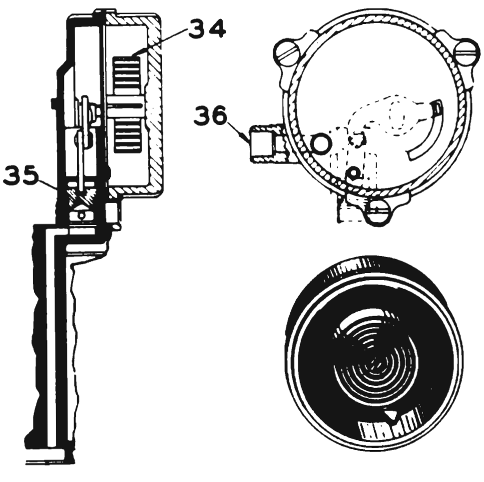


Fig. 6-82. Climatic Control

When the engine warms up sufficiently to run at regular idle speed without stalling, the operation of the choke moves fast idle cam out from under idle speed adjusting screw.

If, for any reason, during starting period, engine is flooded, it is necessary to be able to hold the choke open sufficiently to allow engine to clean excessive gasoline out of intake manifold. This is accomplished by an arrangement of the throttle lever and choke linkage, whereby depressing accelerating pedal to the floor board forces choke open sufficiently to allow engine to clean out intake manifold. This device is called the unloader.

A leaking choke heater tube or connection should either be replaced or tightened.

A sticking choke valve may be caused by a bent shaft, an improperly installed choke valve, or a warped air horn. This may be caused by clamping the air cleaner to air horn too tightly.

If choke valve sticks open, it will result in hard starting. If it sticks closed or partly closed it may result in hard starting and will cause poor gasoline economy and affect engine performance. Sticking parts should be freed up and damaged parts should be replaced.

Choke linkage which may be sticking, bent, or improperly adjusted, will give same results as a sticking choke valve as described above and should be corrected by freeing up, replacing, or adjusting properly. Linkage should be free to fall of its own weight.

In rare cases, foreign matter may get by the screen and cause choke piston to be slow in its action or become entirely stuck.

In either case, result will be same as troubles described for choke valve. If piston and cylinder cannot be cleaned properly, or if they are worn, they should both be replaced.

Thermostatic coil should never be removed from cover. If damaged the entire cover including coil must be replaced.

Fast Idle Adjustment

With choker valve "G" tightly closed, check for clearance of .010″ at "K" between fast idle cam arm and boss on main casting. If clearance is more or less, loosen screw "H" and adjust to give this clearance, then tighten screw "H." Insert gauge wire .012″ in diameter between throttle valve and wall opposite idle port on Model 487S and Model 528S, or .015″ on Model 533S. Screw in idle adjustment screw "L" until gauge just slips out. See Fig. 6-83.

Unloader Adjustment

Two adjustments are necessary in order to get correct unloader setting.

Use a gauge to determine the space between choker valve and wall as indicated at "N." See Fig. 6-84.

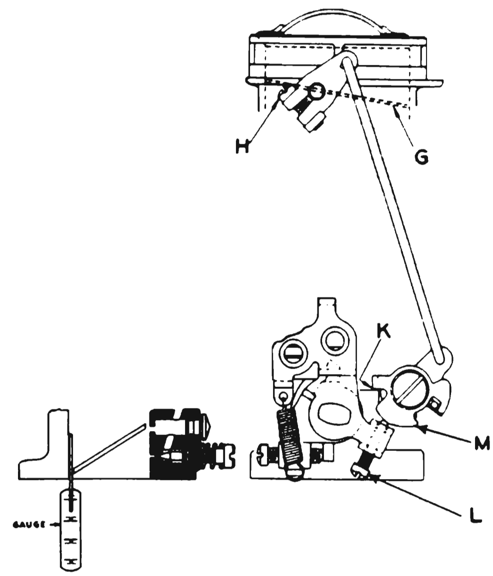


Fig. 6-83. Fast Idle Setting

1. Check for clearance of .010″ at "K" as described under fast idle adjustment and if necessary, correct.
2. Adjust unloader lip "P" on the throttle shaft lever, to give $\frac{3}{16}''$ clearance between choker valve and wall, as indicated at "N," when throttle is wide open.

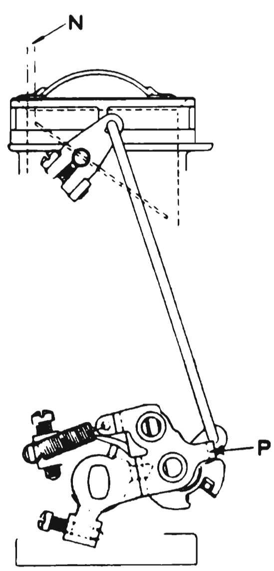


Fig. 6-84. Unloader Setting

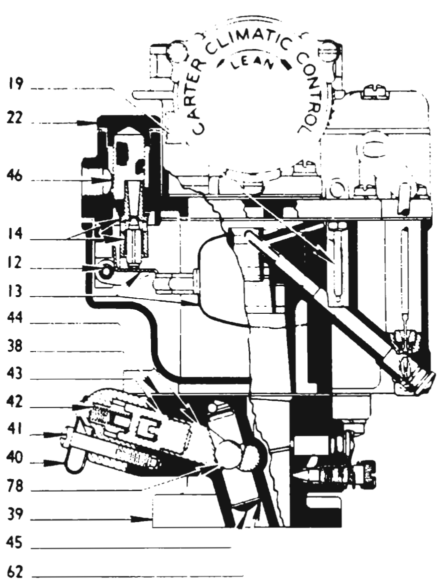


Fig. 6-85. Right Side View

1. Choker lever and screw assembly
2. Air horn & climatic control assy.
3. Thermostatic housing & coil assy.
4. Pump jet and housing assembly
5. Coil housing baffle plate
6. Coil housing gasket
7. Choker piston lever, link and shaft assembly
8. Choke piston
9. Dust cover
10. Throttle connector rod
11. Bowl cover and strainer assy.
12. Float lever pin
13. Float and lever assembly
14. Needle and seat assembly
15. Vacumeter piston link
16. Vacuum piston and pin assembly
17. Metering rod
18. Metering rod jet and gasket assy.
19. Low speed jet assembly
20. Fast idle connector rod
21. Bowl cover gasket
22. Strainer, nut and gasket assy.
23. Metering rod arm and screw assy.
24. Pump arm spring
25. Pump arm and collar assembly
26. Choker valve
27. Pump operating lever & counter-shaft assembly
28. Pump plunger guide
29. Pump plunger and shaft assy.
30. Pump spring
31. Vacuum piston spring
32. Intake ball check retainer
33. Pump intake ball
34. Pump strainer
35. Pump check needle
36. Discharge pump check plug
37. Pump relief plug assembly
38. Body flange gasket
39. Body flange assembly
40. Terminal cap hold-down clip

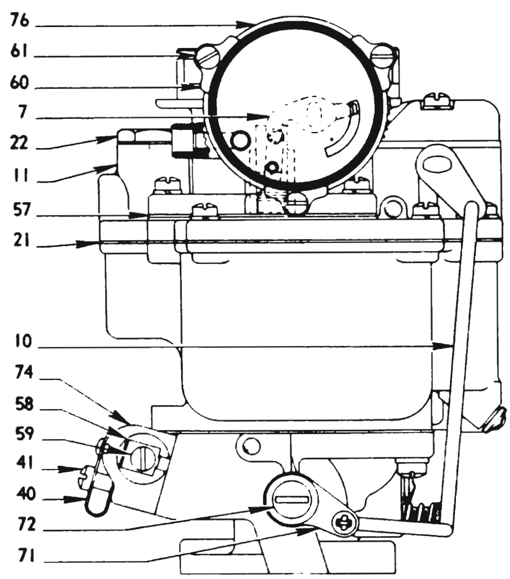


Fig. 6-86. Right Side View

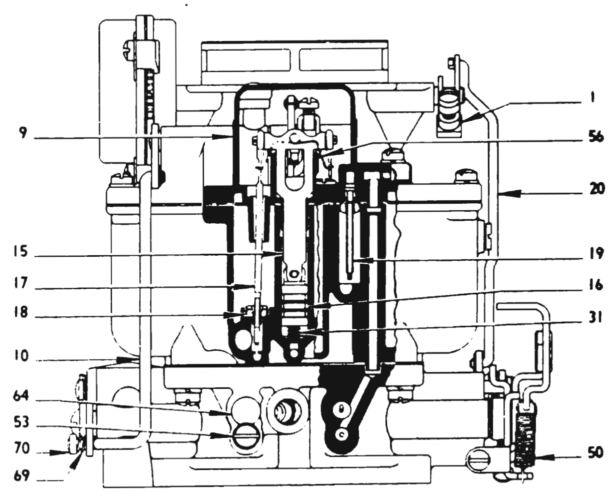


Fig. 6-87. Front View

41. Terminal cap attaching screw
42. Switch return spring
43. Switch guide block
44. Switch plunger
45. Switch strainer
46. Bowl cover strainer
47. Cam trip lever
48. Fast idle cam assembly
49. Throttle shaft dog, collar and screw assembly
50. Throttle flex spring
51. Throttle shaft and lever assy.
52. Throttle lever adjustment screw
53. Idle adjustment screw
54. Fast idle adjustment screw
55. Fast idle attaching screw
56. Metering rod spring
57. Air horn gasket
58. Terminal lockwasher
59. Switch terminal screw
60. Coil housing retainer
61. Coil housing and pump arm attaching screw
62. Switch strainer retainer ring
63. Throttle valve
64. Idle port rivet plug
65. Bowl cover and dust cover attaching screw
66. Air horn attaching screw
67. Throttle centering screw
68. Adjustment screw lock spring
69. Connector rod spring
70. Spring retainer
71. Throttle shaft arm
72. Throttle shaft arm attaching screw
73. Pump arm link
74. Terminal cap assembly
75. Pump guide retainer screw
76. Air horn and piston housing
77. Level sight plug
78. Switch ball
79. Choke piston pin

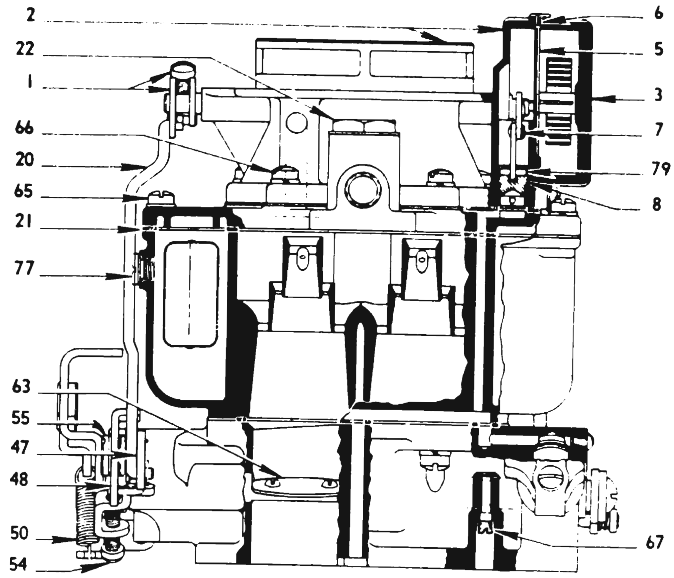


Fig. 6-89. Rear View

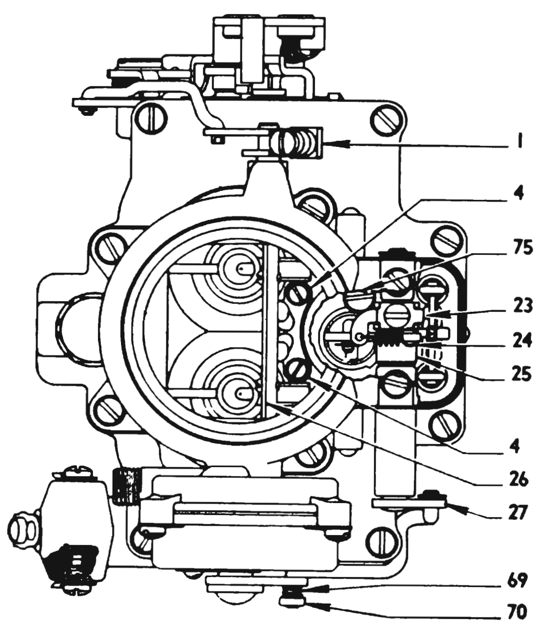


Fig. 6-88. Top View

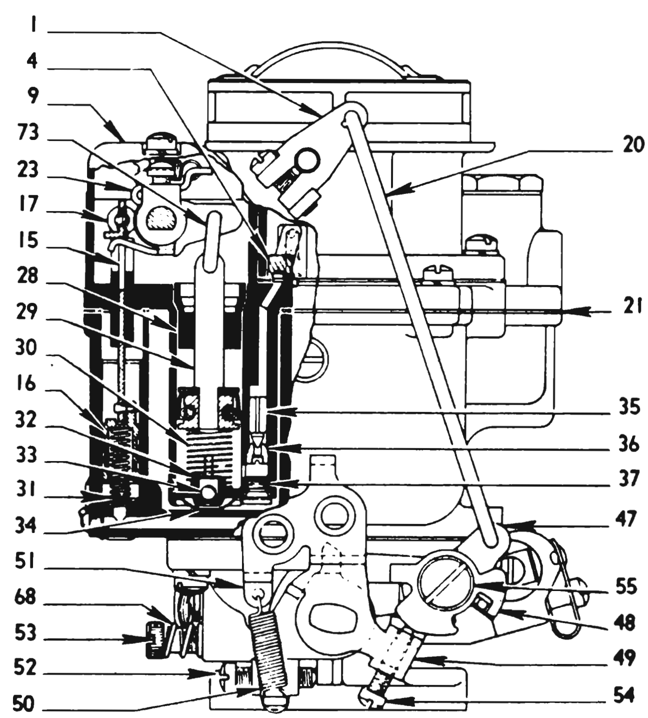


Fig. 6-90. Left Side View

Disassembly and Assembly

Disconnect climatic control tubing, two starter connections, throttle rod, air cleaner, and proceed as follows after removing carbureter from manifold: (See Figs. 6-85 to 6-90 inclusive)

1. Remove choker lever and screw assembly (1) and fast idle connector rod (20).
2. Remove air horn and climatic control assembly (2) intact.
3. Remove thermostatic coil and housing assembly (3), gasket (6) and baffle plate (5).
4. Remove choke valve (26), choke piston lever, link and shaft assembly (7) and piston (8). Don't lose piston pin (79).
5. Remove pump jet and housing assembly (4). Then lift off air horn gasket (57).
6. Remove dust cover and gasket (9).
7. Remove throttle connector rod (10).
8. Remove pump connector link (73), strainer nut and gasket (22), and bowl strainer (46).
9. Remove bowl cover assembly (11) intact. Lift out vacuum piston spring (31). **Do not, under any circumstances, attempt to remove nozzles from body casting.**
10. Remove float pin (12), float and lever assembly (13) and needle and seat assembly (14).
11. Revolve vacuum piston (16) one-quarter turn and remove from vacumeter piston link (15).
12. Raise vacumeter piston link (15) and at same time turn pump arm and countershaft assembly (27) to allow link (15) to come free.
13. Remove low speed jets (19).
14. Remove bowl cover gasket (21).
15. Remove pin spring from end of pump countershaft (27). Loosen screw on metering rod arm (23). Then slide out countershaft and lever assembly (27). Disassemble pump arm and collar assembly (25), metering rod arm (23) and spring (56).
16. Hold finger on plunger guide (28) and then remove pump plunger guide screw (75). Lift out plunger guide (28), pump plunger assembly (29) and pump spring (30).
17. Invert bowl cover casting (11) and remove pump strainer (34) from lower end of the pump cylinder. Tap soft brass pin through the hole in bottom of pump cylinder to knock out intake ball (33) and ball retainer cap (32)
18. Remove pump relief plug assembly (37) from lower end of pump discharge passage. Then remove pump discharge check plug (36) and needle (35).
19. Remove metering rod jet and gasket assemblies (18).
20. Invert carbureter and remove body flange (39) and switch assembly (74).
21. Remove terminal cap clip (40) and screw (41). Hold switch (74) firmly against casting while removing screw. Disassemble switch (74) and remove ball (78). Be careful not to lose small square shims. Invert casting and remove switch strainer (45) and retainer ring (62).
22. Remove screw, washer and throttle shaft arm (71).
23. Remove throttle valves (63) and throttle centering screw (67).
24. Slide out throttle shaft (51) and disassemble.
25. Remove fast idle cam (48) and cam trip lever (47).
26. Remove idle adjustment screws (53) springs (68) and idle port plugs (64).
27. Wash all parts in clean gasoline **except coil and housing assembly (3) and switch parts** (74). Blow out all passages with compressed air and scrape carbon from bores of flange and replace all worn or damaged parts.

Reassembly

28. Throttle shaft dog, collar and screw assembly (49) on throttle shaft and hook up throttle flex spring (50) and then insert assembly into flange casting (39).
29. Install throttle centering screw (67).
30. Install throttle valves (63) using new screws. Small "c" in circle on valves (63) should be toward manifold and on idle port side of bores. Back out throttle lever adjusting screw (52). Hold valves (63) with

fingers and tap lightly with screwdriver to center before tightening screws.

31. Install fast idle cam (48), cam trip lever (47) and spring.
32. Install throttle shaft arm (71), washer and screw.
33. Install *new* idle port rivet plugs (64), idle adjustment screws (53) and springs. Set idle screw to specifications.
34. Install body flange gasket (38). Then assemble flange (39) to body casting.
35. Install both metering rod jets (18) using new gaskets.
36. Install ball (33) in bottom of pump cylinder and then insert ball retainer cap (32). Use rod from tool T109-122U to put cap in place, and then cylinder from tool to tap cap firmly in place.
37. Invert bowl cover (11) and drop check needle (35) into pump discharge passage, **blunt end first.** Then install discharge pump check plug (36) and passage plug (37). Then slide pump strainer (34) into place.
38. Install both low speed jets (19).
39. Install pump spring (30), pump plunger assembly (29), plunger guide (28) and guide screw (75).
40. Slide pump arm and countershaft (27) into bowl cover (11) boss at the same time holding pump arm and collar assembly (25) and metering arm (23) in place. Insert pin spring on end of countershaft and tighten metering rod arm screw (23). Then install pump operating spring (30).
41. Install needle seat (14) using new gasket, needle (14), float and lever assembly (13) and float pin (12).
42. Float Adjustment: Two separate and distinct float adjustments must be made—lateral and vertical—as follows:

    Lateral (side-clearance) adjustment: With bowl cover assembly (11) inverted, and needle (14) seated, sight directly down on each float. The sides of floats must be aligned with small indicator bosses on bowl cover casting (11). Adjustment can be made by bending float arm (13), **not float.**

    Vertical Adjustment: With bowl cover (11) inverted, distance between machined surface of casting and seam of float should be $\frac{3}{16}$". Use Carter gauge, T109-162. Both floats must be evenly adjusted. Make adjustment by bending arm (13) **not float.** •

    Carefully remove float, install bowl cover gasket (21) and then reinstall float. •
43. Install vacuum piston spring (31) in vacuum cylinder and then put bowl cover (11) as assembled, into place. Pull screws down evenly. •
44. Install pump connector link (73) and pin spring, throttle connector rod (10), spring (69) and retainer (70). •
45. *Pump Adjustment:* With connector link (73) in place and throttle adjustment screw (52) backed out, pump plunger (29) should travel $\frac{1}{4}$" if in outer hole or $\frac{7}{32}$" if in inner hole from closed to wide open throttle position. (Place body of gauge T109-117S, inverted, on edge of dust cover (9) boss of casting and measure plunger (29) travel by gauging from upper surface of lower end of connector link at plunger shaft (29). Difference in readings on gauge at wide open, and closed throttle position should be 16 for $\frac{1}{4}$" travel and 14 for $\frac{7}{32}$". • Adjustment can be made by bending throttle connector rod (10) at lower angle. Use tool T109-117S with new type indicator arm extended lip on both ends.
46. *Metering Rod* (17) *Adjustment:* Back out throttle adjusting screw (52) so that valves (63) seat, and insert **one** metering rod gauge T109-152 in place of both metering rods (17). Press down lightly on vacuum piston link (15). There should now be less than .005" clearance between shoulder of notch in gauge and part of vacuum piston link (15) on which metering rod (17) hangs. Adjustment can be made by bending extended lip on metering rod arm (23) up or down until correct adjustment is obtained. Only a slight bend is needed.
48. Install new gasket under dust cover (9). A good seal must be made at this point to avoid bowl vent leak.
49. Install bowl strainer and nut and gasket assembly (22).

50. Install air horn gasket (57) and pump jet and housing assembly (4).
51. Install air horn and piston housing (76).
52. Slide choke piston lever, link and shaft assembly (7) into place. Then install choke valve (26) using new screws. Tap choker valve (26) lightly to center before tightening screws. Valve (26) must not bind in any position.
53. Install coil housing baffle plate (5) and coil housing assembly (3) using new gasket (6).
54. Set Climatic Control housing (2).
55. Install fast idle connector rod (20), choker lever and screw assembly (1).
56. Install switch ball (78), switch plunger (44) with **tongue at bottom,** guide block (43) with shims and contact spring in place. Then insert switch return spring (42) and secure in place terminal cap assembly (74) with clip (40) and attaching screw (41).
57. *Unloader Adjustment:* Two adjustments are necessary to get correct unloader setting:
    (a) Loosen choker lever and screw assembly (1) on shaft. Insert .010″ flat feeler gauge between lip on fast idle cam (48) and boss on flange casting (39). Hold choke valve (26) tightly closed and tighten choke shaft arm (7) in place.
    (b) Adjust unloader lip on throttle shaft lever (51) to give clearance between upper edge of choke valve (26) and inside wall of air horn (76) with the throttle wide open.
58. *Fast Idle Adjustment:* With choke valve (26) tightly closed, adjust fast idle set screw (54) to give clearance between the throttle valve (63) and bore of carbureter (side opposite port).
59. *Starter Switch Adjustment:* See Starter Vacuum Switch (Carter) in Electrical Section.

Special tools for servicing Carter Carbureters and chokes may be obtained from Hinckley-Myers.

KMO-269-C—Carbureter Tool Set for Carter Carbureters Consisting of:

J-818-3........3/16″ Float Gauge
J-818-7........3/32″ Float Gauge
J-816-8........5/32″ Jet Wrench
J-816-1........3/16″ Jet Wrench
J-816-2........1/4″ Jet Wrench
J-816-4........7/16″ Jet Wrench
J-816-7........5/16″ Jet Wrench
J-816-5........Jet Wrench Handle
J-508 ....Nozzle Puller
J-1306 ....Ball Retainer Ring Remover
J-787 ....Link Adjusting Tool
J-1305 ....Metering Rod Gauge
KMO-269-C-1 ..5/8″ and 3/4″ End Wrench

	Series 40 Std. One Carbureter Carter Equipment (W.C.D.)	Series 50 or (Series 40 Opt. Compound Equipment) Carter Equip.		Series 60-70-90 Carter Equipment (W.C.D.)	
	487S	528S—Front	529S—Rear	533S—Front	534S—Rear
Metering Rod Jet	.082″	.086″	.085575″	.08575″	.0531″
Metering Rod	#75-459	#75.492	None	#75-473	None
Metering Rod Setting	2.44″	2.44″	None	2.44″	None
Pump Stroke	21/64″	1/4″	None	7/32″	None
Pump Spring	#61-212	#61-262	None	#61-262	None
Pump Jet	#73	#74	None	#74	None
Fuel Level	Bottom of Inspection Hole	Bottom of Inspection Hole		Bottom of Inspection Hole	
Large Venturi	1 1/16″	7/8″	7/8″	1 1/16″	1 1/16″
Vacuum Spark Port (Bottom of hole to top of valve)	.046″ to .050″	.035″ to .039″	None	.035″ to .039″	None
Low Speed Jet	#68	#65	#65	#65	#65
By-Pass	#55	.0512″	.0512″	.0512″	.0512″
Economizer	#65	#65	#65	#65	#65
Idle Bleed	#58	.0512″	.0512″	.0512″	.0512″
Float Needle Seat	#42 (.093″)	#42 (.093″)	#42 (.093″)	#42 (.093″)	#42 (.093″)
Float Setting (between cover and float)	3/16″	3/16″	3/16″	3/16″	3/16″
Thermostat Setting	Index	Index	None	Index	None
Suction Hole	#45	#40	None	#36	None
Fast Idle Setting	.012″	.012″	None	.015″	None
Deloader Setting	3/16″	3/16″	None	3/16″	None
HIGH ALTITUDE					
Metering Rod	#75-489	#75-503	None	#75-490	None
Metering Rod Jet	——	——	None	#44	None
	No other changes	——No other changes——		——No other changes——	

AIR CLEANER

INTAKE SILENCER AND AIR CLEANER

All series are equipped with intake silencers and heavy duty air cleaners. These units also function as a flame arrester in event of "backfire" in the intake system.

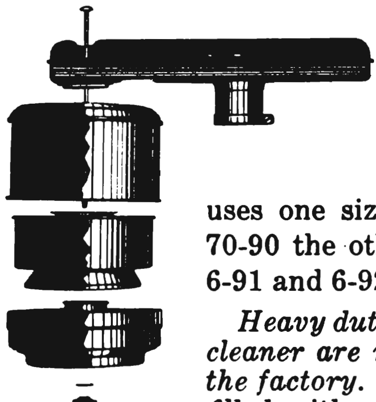


Fig. 6-91. Heavy Duty Std., Series 40

Two sizes are supplied. Series 40 uses one size and Series 50-60-70-90 the other sizes. See Figs. 6-91 and 6-92.

Heavy duty intake silencer and cleaner are not filled with oil at the factory. These units must be filled with one pint of S.A.E. 50 oil at time car is put in service.

AIR CLEANER SERVICE INFORMATION

It is very difficult to set any definite limits for cleaning or washing. This is due to wide variation of operating conditions. If car is in use under normal dust conditions, washing cleaners every 5,000 miles is sufficient, but for extreme dust conditions, cleaners should be washed more frequently. To wash cleaner element remove the section of cleaner containing oil supply. Wash this unit thoroughly with gasoline or kerosene. Also remove the cleaner element assembly, wash thoroughly by dipping several times in gasoline or kerosene, then dry.

CAUTION—Do not dry with a hard blast of air from air hose, and do not dip the cleaner element in oil before assembling. Fill oil sump with one pint S.A.E. 50 oil and reassemble air cleaner on engine.

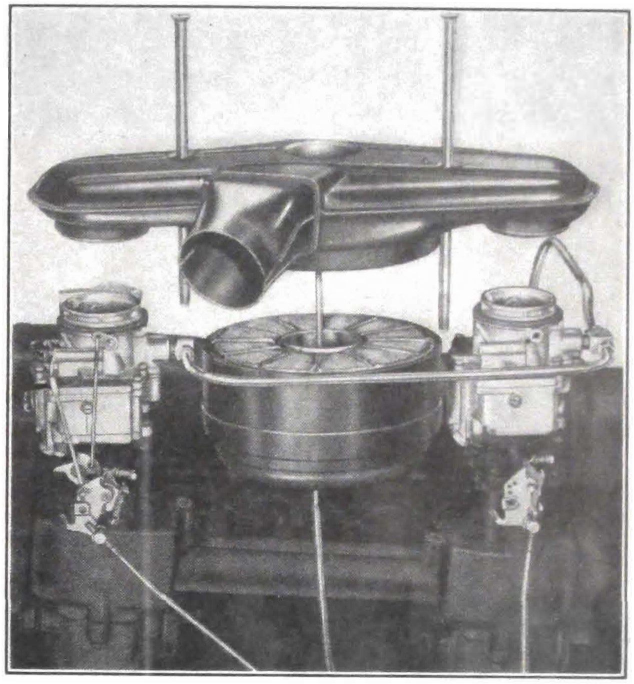


Fig. 6-92. Heavy Duty, Compound Equipment

Air Inlet

All compound carburetion engines are equipped with an air induction system which embodies a separate air silencer unit as well as an inlet

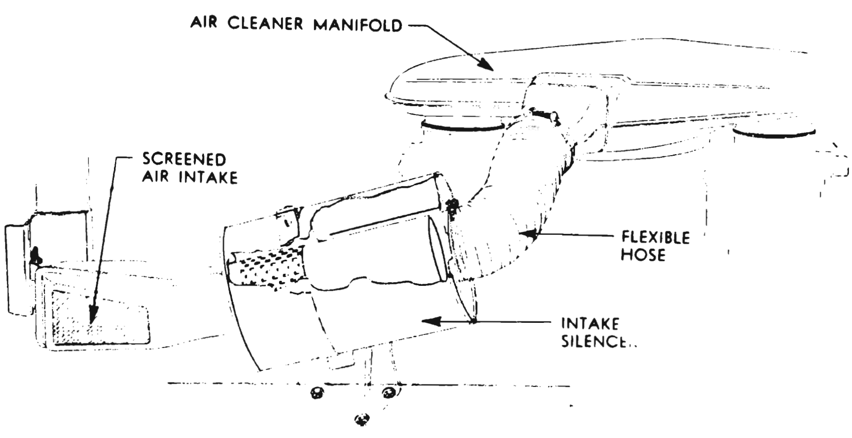


Fig. 6-93. Air Intake and Silencer—Compound Carburetor

shield assembly, so located to draw fresh air ahead of the radiator core.

The air manifold used on compound carburetor equipped engines is similar to and interchangeable with the 1941 air manifold.

The air inlet silencer assembly is an entirely new unit and is mounted on a bracket attached to the left fender skirt.

The air inlet shield assembly is welded to the forward end of the silencer. A short piece of hose connects the silencer with the air cleaner.

A screen is provided over the inlet of the air shield assembly to prevent large insects and other material from entering system. Screen must be kept clean at all times so as to provide free flow of air to the carburetor system.

Oil filters should be serviced according to instructions in "Engine Oiling System."

FUEL PUMP

AC Type AJ combination fuel and vacuum pump are used on all series. However, Series 40-50 use a rocker arm different than the Series 60-70-90. See Fig. 6-94.

The Series 60-70-90 fuel pump is equipped with an air dome on the outlet side of pump to increase the fuel output. See Fig. 6-95.

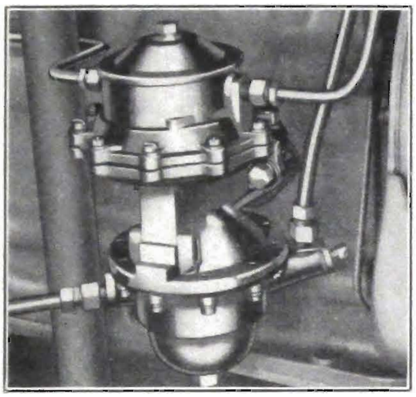


Fig. 6-94. Combination Fuel and Vacuum Pump

FUEL FILTER

The fuel filter is an integral part of the fuel pump. It comprises a metal sediment bowl with a special ring type strainer through which the fuel must pass upward. See Fig. 6-96. Dirt and water settle in the bowl. The strainer can be removed for cleaning by first removing the bowl. See Fig. 6-97. Clean the strainer as follows:

1. Wipe off all dirt on outside of unit. Loosen nuts "A" and gently blow through the strainer with a stream of air. See Fig. 6-96.
2. If the strainer is gummy, wash in benzol, alcohol or methanol to remove gum, and then blow through it with a stream of air.
3. Tighten nuts finger tight and replace unit in pump, making certain that cork gasket is properly seated.
4. Cork gasket should be renewed each time bowl is removed. Make sure cork gasket is assembled between strainer element and metal bowl; otherwise no filtering action will take place.

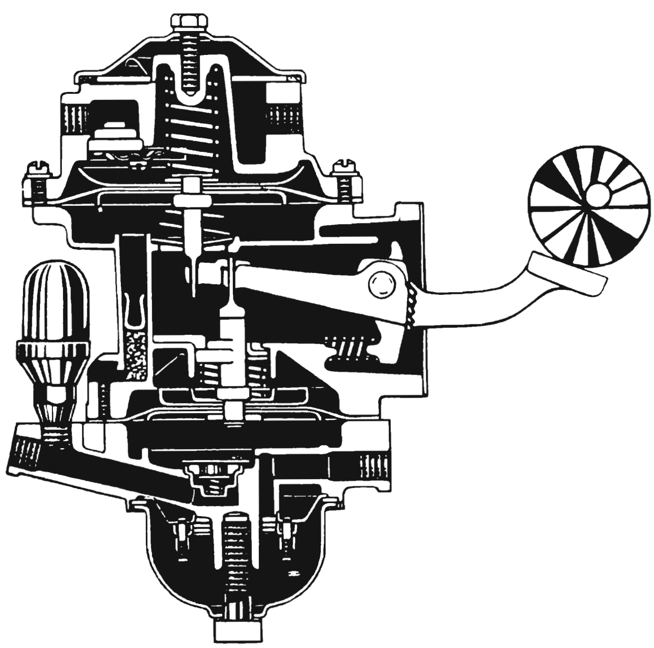


Fig. 6-95. Fuel Pump

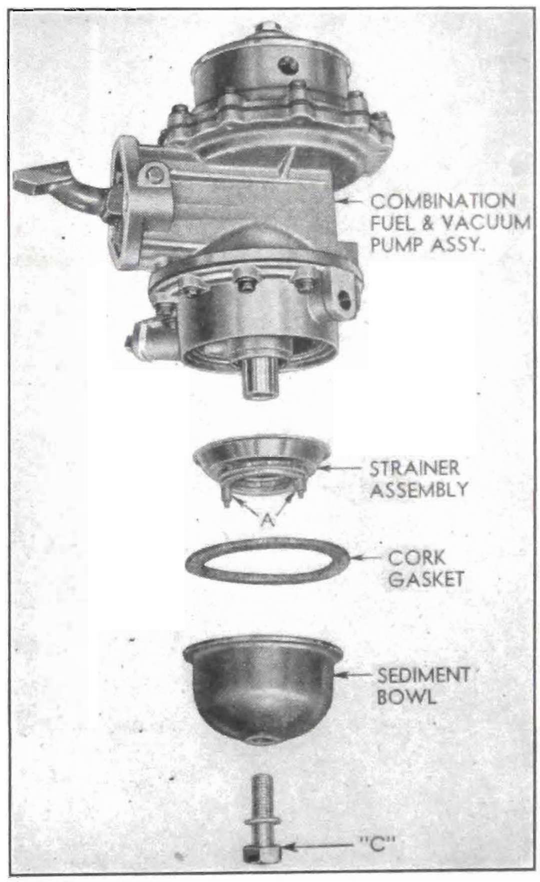


Fig. 6-96. Fuel Pump, Disassembled

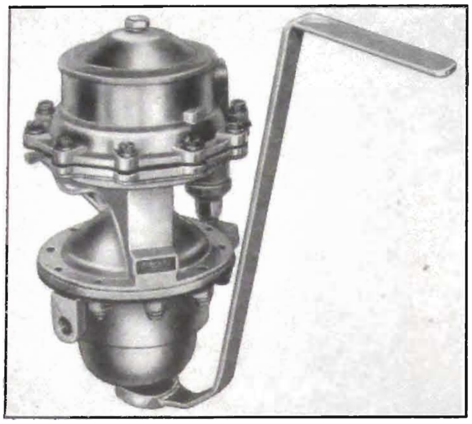


Fig. 6-97. Removing Sediment Bowl

It is important that strainer and bowl be inspected and cleaned frequently, thus reducing to a minimum, the possibility of dirt being forced into fuel pump valves, carburetor jets and float needle. Dirt at float needle seat will cause flooding.

Fuel Pump Pressures
Taken at Carburetor (Engine Cold)

All Series.................................4 to 5¼ lbs.

Vacuum Unit Test—*All Series*

Due to the strength of the spring used in the vacuum pump unit, it is not practical to attempt a bench test of the completed pump after assembly, except where special equipment is available.

The only practical test for the completed combination fuel and vacuum pump is on the engine.

Reinstall the completed pump on the engine. To check the performance of the vacuum pump unit, open the windshield wiper valve and observe the performance while alternately idling and accelerating the engine. Operation of the windshield wiper should continue regardless of the engine speed or throttle opening.

CAUTION

Never operate pump with the outlet passage of the vacuum pump unit closed with a plug of any sort. The downward or exhaust stroke of the pump is positive and the mechanism may be damaged if this caution is neglected.

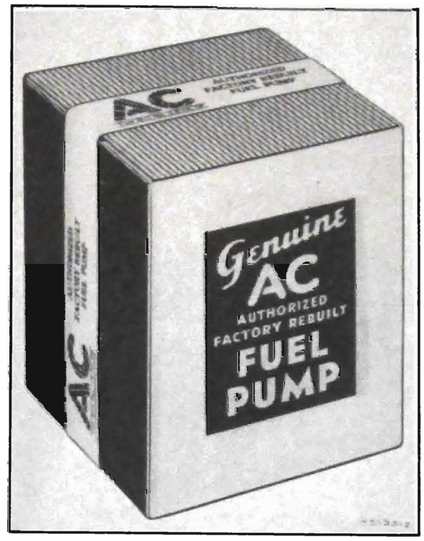


Fig. 6-98. Fuel Pump Package

Valves

Never stretch or in any way change tension of the valve spring as this will change pressure of spring against the valve and reduce capacity of the pump, particularly under extreme conditions. Always use new valve assemblies if the old valves are at all questionable.

Fuel pump operation may be impaired due to gum from gasoline on valves, making it impossible to operate. When this trouble is encountered in connection with fuel pump, it is necessary to replace assemblies to insure correct operation of the pump. It is possible that the trouble will be overcome with a different grade of gasoline.

REPLACEMENT FUEL PUMPS

There is available through all AC wholesalers factory rebuilt fuel pumps which will be handled on an exchange service basis. Time will often be saved by taking advantage of this exchange policy. It is always advisable for the dealer to carry in stock one or two of the types of pumps used. See Fig. 6-98.

CLUTCH

There are two types of clutches used, the crown pressure spring type on Series 40-50, see Fig. 6-99, and coil pressure spring type on Series 60-70-90, see Fig. 6-100. Both types use grooved face lining for quicker release. Grooves are pressed in lining during manufacture.

CLUTCH DRIVEN PLATE

Both types of clutches use woven facings mounted to clutch plate with two rows of rivets. The outer circle of clutch plate where linings are attached is reduced in thickness and waved to form a cushion effect between linings while clutch is being engaged. See Figs. 6-101, 6-102.

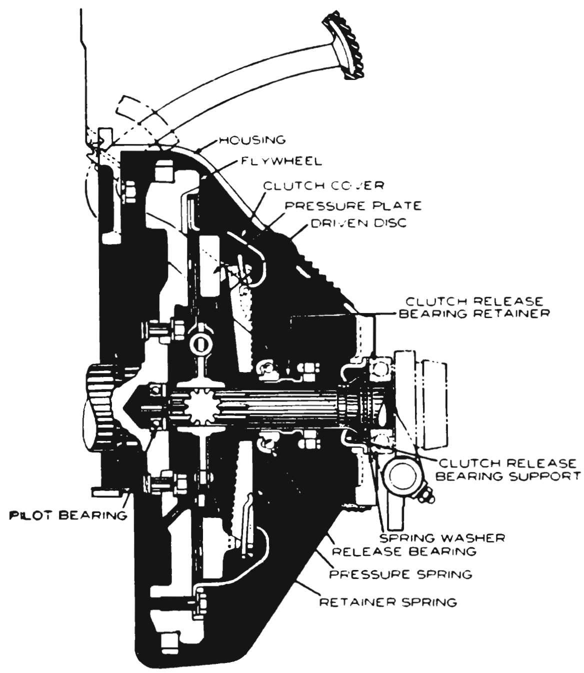


Fig. 6-99. Clutch—Series 40-50

Depressing a properly lashed clutch pedal to the floor results in approximately .080″ release of pressure plate. Clutch driven plate will expand approximately .050″ when released. This leaves clearance of .030″ for possible lateral run-out of the assembly.

Driven plate hubs are all 1⅛″ in diameter and have ten splines.

Driven plate assemblies are equipped with dampening device between hub and plate, consisting of torsional coil springs located around the hub and a molded friction washer between plate and hub. See Figs. 6-101 and 6-102. Driven plates are of the same design in both types of clutches. These springs are held in place by the forming of plate and drive washer when the assembly is riveted together.

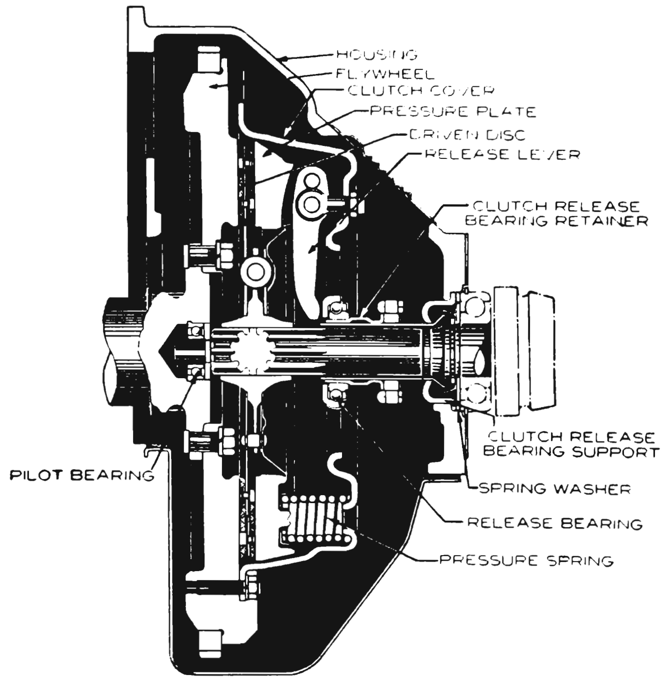


Fig. 6-100. Clutch—Series 60-70-90

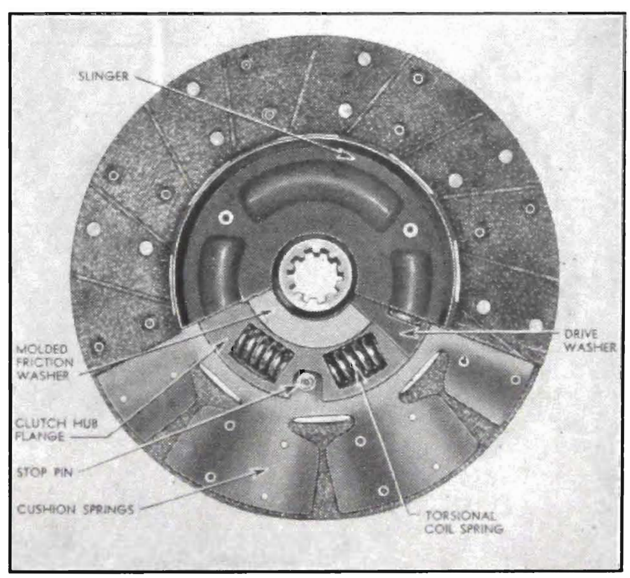


Fig. 6-101. Driven Plate—Series 40-50—Transmission Side

The dampening device prevents torsional periods of the engine being transmitted to the transmission gears which would cause rattle.

Construction of the dampening device is as follows: The clutch plate is riveted to the drive washer and the flange of the hub is located between them. The clutch plate drives the clutch hub through torsional coil springs. The three rivets holding plate and drive washer together also act as stops for the limiting of the travel of torsional coil springs, whenever shock loads are taken through clutch assembly. Frictional dampening is supplied by use of a molded friction washer compressed between clutch plate and clutch hub.

Driven plate assembly can only be installed one way, with the large oil baffle to the rear or next to the transmission. Driven plate assemblies are balanced during manufacture, either by grinding edge of facing or by rivets. Balancers should not be removed. All plates are fitted with baffles to keep oil or oil vapor from the facings.

Clutch Driven Plate Servicing (Both Types)

Driven plates are only serviced as an assembly.

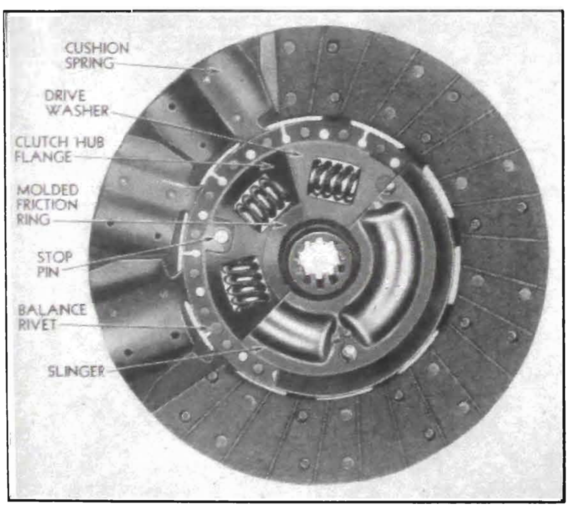


Fig. 6-102. Driven Plate—Series 60-70-90—Transmission Side

In assembling new driven plate, hub should be fitted over transmission drive gear and an easy sliding fit on splines should be maintained.

Driven plate run-out should not be more than .025", checking on flywheel side of clutch lining. This check can be made by using service tool or by sliding the driven plate over the transmission main drive gear until it is tight on the spline. Mount indicator on transmission to read run-out of plate. See Fig. 6-103.

CAUTION: When rotating plate care should be used to prevent errors in run-out reading because of looseness in transmission main shaft bearing.

Inspect transmission main drive gear pilot bearing for lubrication. A service transmission main drive gear should be used for piloting hub or driven plate with pilot bearing in crankshaft. Always use transmission guide pins J-851 when assembling transmission to prevent springing driven plate hub, causing lateral run-out of plate.

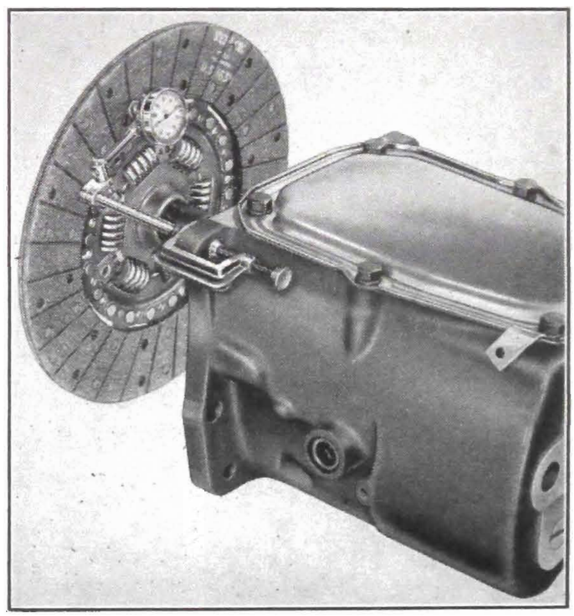


Fig. 6-103. Tool J-688A

CROWN SPRING PRESSURE PLATE

Crown pressure spring type has pressed metal cover piloted to flywheel with six close fitting special cap screws. Cover is ventilated to cool clutch by windows stamped in metal.

Cover is so formed to act as a fulcrum for the crown pressure spring, cover and pressure plate is designed with twelve driving lugs. The pres-

sure plate cover, pressure plate and crown spring are held in position as an assembly by six clutch spring retainers located in driving lugs of pressure plate and hooked over ears located on steel cover. The drive is from flywheel through cover crown spring to pressure plate to driven plate.

Disassembly of Crown Spring Pressure Plate

1. Place assembly on flat surface with pressure plate lying surface down and mark pressure plate, crown spring, and cover so that they may be assembled in same position. Do not prick punch spring, use paint or chalk. See Fig. 6-104.

2. Unhook six retaining springs for clutch cover. Use service tools J-1039-1 and J-1039-2. Working spring slightly toward center of pressure plate will aid in this operation. Do not hammer on tool to engage same under spring because bending of clutch cover will result.

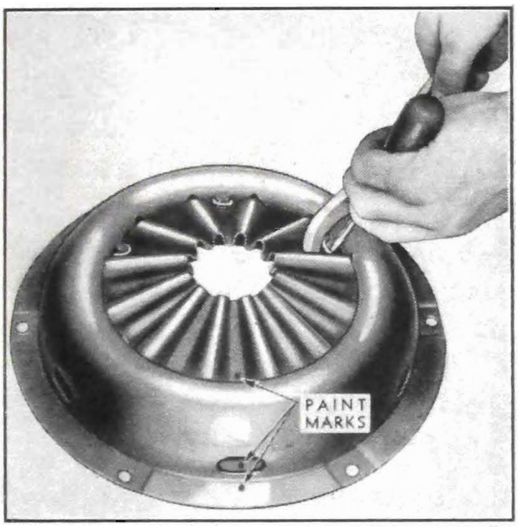


Fig. 6-104. Pressure Plate Assembly

3. Remove clutch cover.

4. Unhook all retainer springs from crown spring by working one leg of retainer spring toward center of clutch and other leg away from the center. See Fig. 6-106.

5. After crown spring is removed, the six retainer springs may be removed from pressure plate.

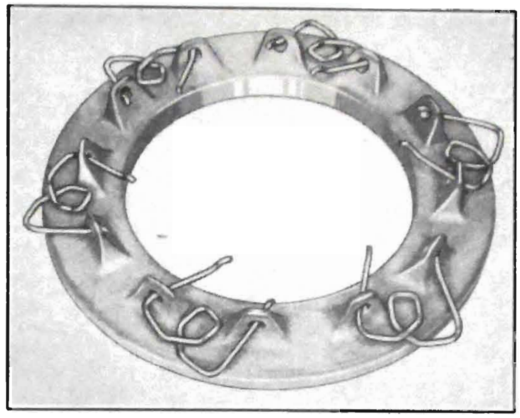


Fig. 6-105. Retainer Spring Positioning

Assembly of Crown Spring Pressure Plate

To assemble, reverse procedure of disassembly, with the following caution:

1. Retainer springs must be inserted in pressure plate with curved ends of retainer spring legs toward crown spring. See Fig. 6-105.

2. Retainer springs must be positioned with one leg toward center of clutch and other leg away from center.

3. Marking on pressure plate, crown spring and cover, which were made before disassembly, must be lined up in order to maintain balance. See Fig. 6-104.

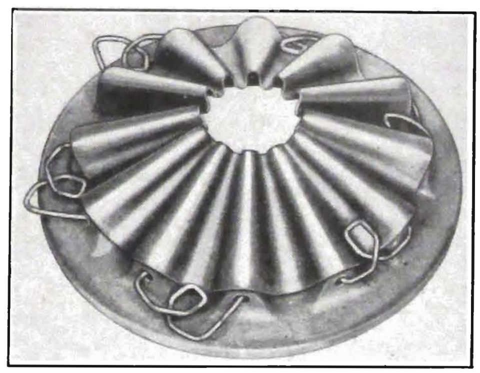


Fig. 6-106. Clutch Spring

4. Use "Lubriplate" or Delco Brake Lubricant very sparingly where retainer springs contact crown spring and where crown spring contacts pressure plate. Also where crown spring contacts cover. Excessive lubrication will ruin clutch facings.

COIL SPRING PRESSURE PLATE

Coil spring pressure type has pressed metal cover with twelve coil springs applying pressure to cast-iron pressure plate, three release levers, spring retainers at each end of all pressure springs, and necessary pins and linkage. See Fig. 6-107. The cover is ventilated for cooling

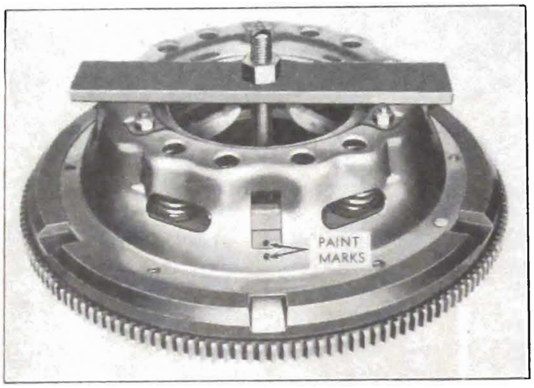


Fig. 6-107. Clutch Disassembly

and is bolted to flywheel with six piloted cap screws. The drive is from flywheel through three driving lugs in cover to driven plate. The twelve coil springs should have a tension of 144 lbs. each when compressed to $1\frac{3}{4}''$ in length. All twelve springs should then exert 1730 lbs. when installed in clutch and clutch fully engaged.

Disassembly of Coil Spring Pressure Plate

Before disassembling, mark cover and pressure plate so that these can be assembled in the same relationship. These parts are balanced as an assembly at the factory. See Fig. 6-107.

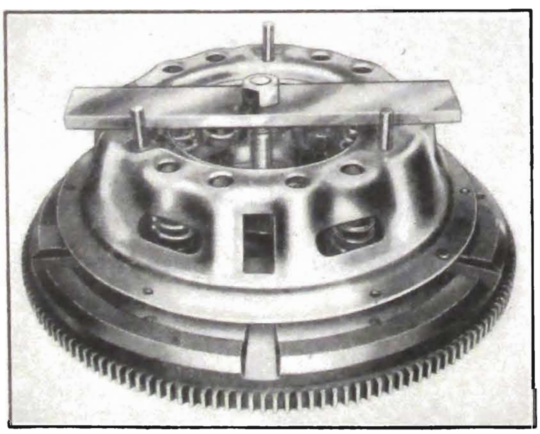


Fig. 6-108. Clutch Assembly

Place assembly on flat surface with support on pressure plate lining surface only, with a bar across top of cover. Press down enough to relieve pressure on the three adjusting nuts. These nuts can now be removed. Releasing the pressure on bar will allow clutch to be disassembled. This operation can be done in an arbor press. An optional method is also shown.

Assembly of Coil Spring Pressure Plate

Place pressure plate on flat surface same as when disassembling. Place coil springs on plate and locate in proper position. Place cover over plate and locate spring in position on cover, remembering to match up markings on cover with plate. Press cover down on springs, making sure that driving lugs enter into slots in cover plate. At the same time, line up the three pivot screws with holes in cover by using service tool J-857. See Fig. 6-108.

CLUTCH PRESSURE PLATE ASSEMBLY —SERVICE

Both types of pressure plates are balanced after manufacture has been completed. Changing parts of the pressure plate assembly is not likely to cause an out-of-balance condition. If out-of-balance should occur, refer to Engine Service section.

A small amount of "Lubriplate" or Delco brake lubricant should be placed on each driving lug when assembling or servicing pressure plate.

PRESSURE PLATE RELEASE LEVERS

Crown spring pressure plate uses no release levers. Release bearing contacts inner circle of spring when releasing. Coil spring pressure plate uses three release levers. The clutch release bearing contacts the inner end of release levers. Levers are hardened to prevent wear at point of contact with release bearing. See Fig. 6-100.

The Series 60-70-90 release bearing exerts 330 lbs. and the Series 40-50 exerts 370 lbs. pressure to completely release clutch. See "Clutch Driven Plate" section for amount of pressure plate movement.

Adjustment of Pressure Plate Release Levers Series 60-70-90

Accurate adjustment of levers, so that pressure plate face always moves parallel to flywheel face, is necessary for satisfactory operation of clutch.

The only accurate method is to adjust levers while the pressure plate is held parallel to flywheel by using service tool J-1036 gauge without adapter. See Fig. 6-109. Place gauge plate in flywheel in position normally occupied by the driven plate. Before the cover is bolted down, be sure the gauge plate is centered with the three machined surfaces, directly under the levers.

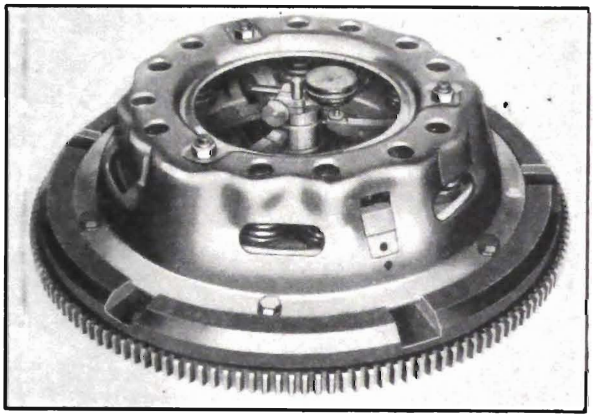


Fig. 6-109. Clutch Lever Indicator Tool

Mount pressure plate assembly on the flywheel, tighten the holding screws evenly when pulling down into flywheel. Otherwise, spring pressure will distort cover.

After cover has been mounted, check alignment of fingers by using service tool J-1013 and dial indicator. Set indicator after mounting on fixture, on any flat surface and correct dial indicator to zero setting. Carefully place fixture and indicator on machined surface of finger adjusting gauge so that dial indicator button is directly over release finger and correct indicator reading at each finger tip to read zero, by turning adjusting nut on clutch cover until all three fingers read within .005″ of each other.

After adjustment is complete lock the nuts with large pliers. The pivot screws are flattened on one side to provide a method of crimping the flange edge of nut to serve as a lock.

When removing gauge, loosen clutch screws evenly until spring pressure is relieved.

Before installing clutch to flywheel, on all series, check flywheel surface. If found rough, start engine, run slowly and smooth up face of flywheel by first using coarse emery cloth and finishing up with fine sandpaper. Remove all dust from flywheel and flywheel housing with an air hose before assembling clutch to flywheel.

CLUTCH RELEASE LINKAGE

Clutch pedals on all series are mounted on frame brackets. Clutch pedals are all bushed at pivot points and have fitting for lubrication. The clutch release linkage incorporates an equalizer which gives a universal action to the clutch release mechanism. See Fig. 6-110. The equalizer is equipped with an inside spring which maintains a load between equalizer and ball stud at fixed end. The outer end is fitted with a rubber bushing having a hardened steel sleeve in the center. The engine bracket holds a hard pin that fits this sleeve. The assembly is provided with a lubrication fitting. This is to stop any possible rattle due to road vibration or uneven engine rotation. See Fig. 6-110.

The equalizer has two levers—the outer is connected by a non-adjustable rod to the clutch pedal and the inner with a lash adjusting nut at the throwout yoke. All lash adjustments are made at this point. Lash adjusting nut is held in position by a lock nut. Clutch yoke is held to fulcrum ball by a spring clip riveted to yoke and snapped behind fulcrum ball in the flywheel housing.

Yoke can be removed by disconnecting linkage at outer end of yoke, pulling outward on yoke to clear release bearing and pivot ball. Yoke can then be removed from bottom side of housing without removing transmission. Flywheel lower housing must be removed. Boots protect opening around yoke and flywheel housing.

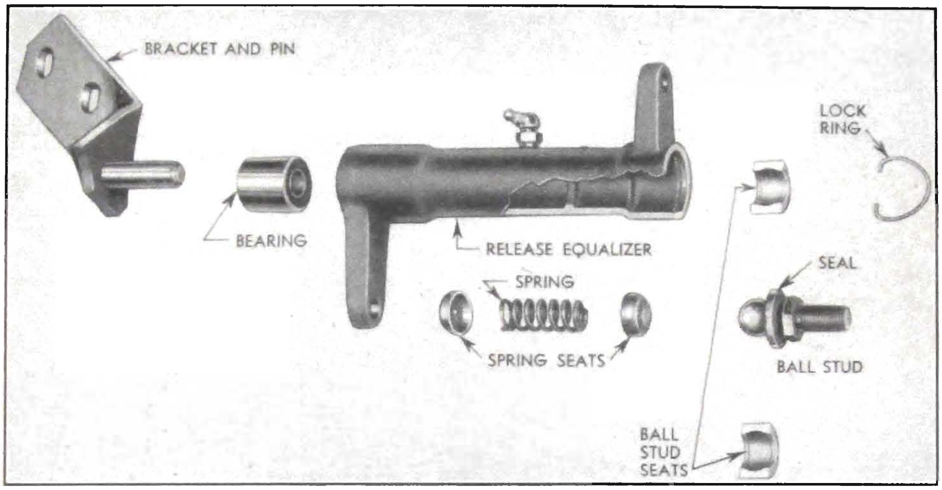


Fig. 6-110. Clutch Equalizer—Disassembled

PEDAL RETURN SPRING

All Series

An over-center type pedal return spring is used. Return spring is mounted between clutch pedal and frame. Spring should be stretched as far as possible by tightening nut at bracket.

Always relieve tension on spring by backing off nut on eye bolt before removing clutch or brake pedal bracket.

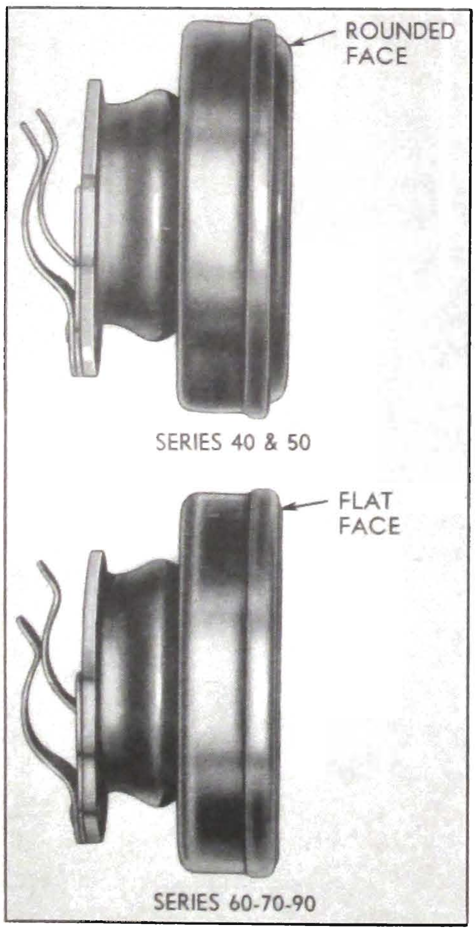


Fig. 6-111. Clutch Release Bearings

CLUTCH PEDAL LASH

A rubber bumper mounted on the underside of the toe board holds the pedal in proper clearance from the floor pan and locates the air seal.

Three-quarters to one inch free movement of pedal should be maintained on all series. This

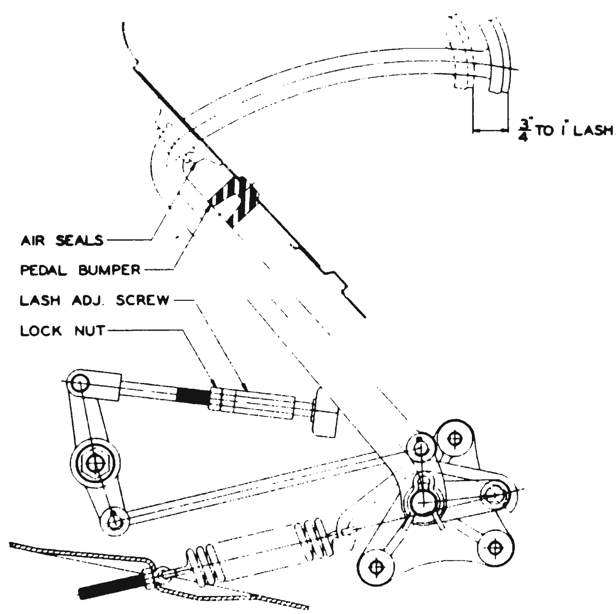


Fig. 6-112. Clutch Pedal Adjustment

lash or free movement is to prevent tension on clutch release bearing while operating clutch in engaged position. Tension on clutch release bearing will cause undue wear of clutch fingers and clutch release bearing and may also cause clutch slippage if tension is great enough.

Lash may be adjusted by turning lash adjusting screws. See Fig. 6-112.

Do not mistake tension of over-center pedal return spring as an indication of lack of pedal lash.

CLUTCH RELEASE BEARING

On Series 40-50 the rounded edge of bearing contacts directly against crown clutch pressure spring.

On Series 60-70-90 the flat side of bearing contacts against clutch release levers. These bearings are lubricated for the life of bearing. See Figs. 6-111 and 6-113.

Clutch Release Bearing Support *(All Series)*

Clutch release bearing supports are held in flywheel housings by a flare at the rear end of support to form a seat. Supports are assembled to flywheel housing by entering from transmission side against a thin gasket and held in place by a cupped spring washer and outer race of front transmission bearing when transmission is drawn in place.

Bearing support must be installed in correct position to make oil drain back properly. This position is attained by lining up the tab on the support with the moulded recess on the flywheel housing. See Figs. 6-99 and 6-100.

A pressed metal bearing retainer is pressed into clutch release bearing. The retainer fits around support. The bearing retainer is attached to forked end of throw-out yoke by a spring clip riveted to retainer. Groove in retainer should be filled with front wheel bearing lubricant.

TRANSMISSION MAIN DRIVE GEAR

All series use an N.D. ball bearing in rear of crankshaft for transmission main drive gear pilot bearing. Bearing is a press fit in crankshaft. Bearing ordinarily requires no lubrication. If lubrication is necessary, use front wheel bearing lubricant very sparingly. Otherwise, lubricant will run down face of flywheel when hot and ruin clutch facings.

CLUTCH REMOVAL

All Series

1. Remove rear axle and transmission. See Fig. 6-114.
2. Remove lower flywheel and clutch housing.
3. Disconnect clutch linkage at outer end of release yoke.
4. Remove spring washer, in flywheel housing, which retains clutch release bearing support. Remove support. Clutch release bearing and release yoke may now be removed from fulcrum as an assembly by pulling outward on outer end of yoke.
5. Mark pressure plate assembly position in flywheel so that it may be reassembled in same relative position in order to preserve engine balance.

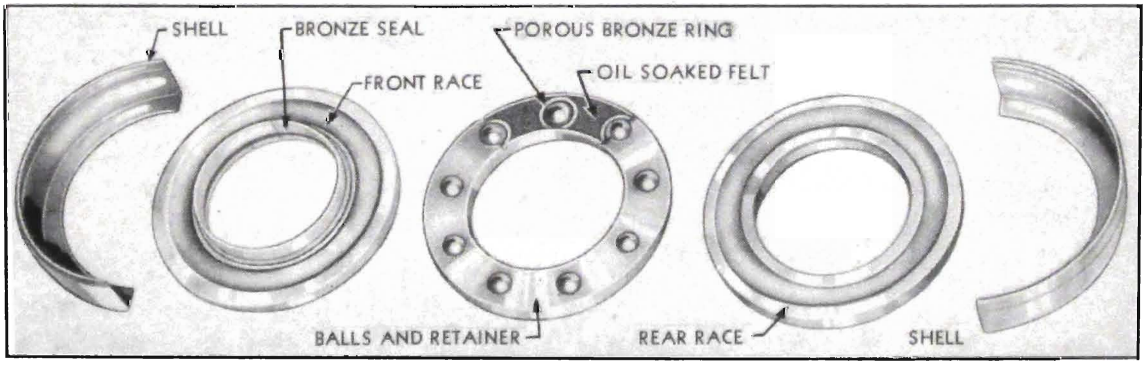


Fig. 6-113. Clutch Release Bearing—Parts

6. Remove clutch pressure plate assembly by loosening retaining screws evenly. Use of metal spacers between release levers and clutch cover will relieve spring tension on retaining screws and facilitate clutch handling. On Series 40-50, spacers cannot be used and are not necessary.

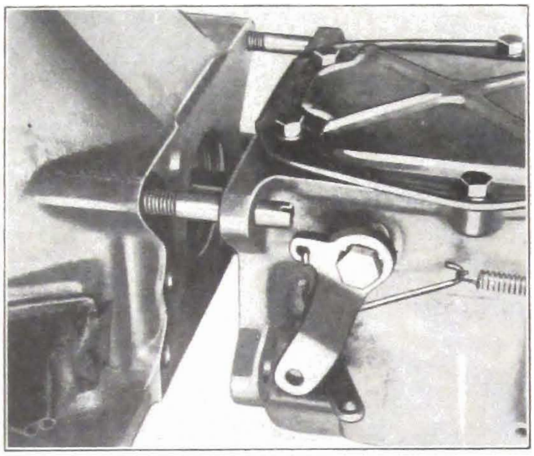


Fig. 6-114. Transmission Guide Pins

CLUTCH INSTALLATION

All Series

Follow reverse procedure of removal. In addition, special attention should be given to the following procedure:

1. Make sure the main drive gear pilot bearing is in place in rear of crankshaft and that it is in good condition and not over-lubricated.
2. Examine driven plate for wear, condition of torsional springs and presence of oil on facings. See that clutch hub slides freely on splines of clutch gear. If plate is not in good condition a new driven plate assembly should be used.
3. Check adjustment of pressure plate release levers as outlined in "Adjustment of Pressure Plate Release Lever" section. This applies to Series 60-70-90 only. An extra or used flywheel used as a tool will simplify this operation.
4. Place driven plate assembly on pressure plate assembly. The oil baffle side of the driven plate assembly must be installed to the rear or transmission side. The plain side of assembly goes toward flywheel.
5. Place driven disc and pressure plate assemblies in place. Match markings made before removal so that clutch assembly is reinstalled in same relative position in flywheel. Start screws which hold pressure plate to the flywheel.
6. Insert extra transmission main drive gear through driven plate hub and center same in pilot bearing. Tighten screws evenly until pressure plate assembly is tight against flywheel. As pressure plate tightens against driven plate move main drive gear from side to side to center driven plate in clutch assembly. Unless the clutch driven plate is centered during the clutch assembly trouble will be experienced sliding the transmission into position.

   An extra or used main drive gear should be available as a tool for lining up clutch driven plates.
7. When installing release bearing retainer on support, some front wheel bearing lubricant should be placed in recess on underside of retainer to act as a lubricant.

CLUTCH PEDAL PRESSURE

If over 35 lbs. on Series 40-50, or 28 lbs. on Series 60-70-90, is required to depress pedal to floor board, the trouble will usually be found to be in dry release linkage or pressure plate driving lugs needing lubrication. Check for lubricant going to both sides of equalizer on all series. Remove lower flywheel and clutch cover and brush small amount of "Lubriplate" or Delco brake lubricant (NOTE: *This is not Delco Hydraulic Brake Fluid*) on each of three driving lugs while clutch pedal is being operated on Series 60-70-90. On Series 40-50 use a small amount of "Lubriplate" on clutch spring where it contacts cover.

It is very unlikely that resistance or noise will occur in the pressure plate levers or springs because of the relative small movement of these parts. If clutch release bearing support has been incorrectly assembled or bent, noise and resistance may occur between the clutch release bearing retainer and support. "Lubriplate" or Delco brake lubricant may be brushed on the contact point of these parts without removing same. Clutch yoke fulcrum balls should need lubrication only at time of assembly. However, release yoke can be snapped off of fulcrum ball by disconnecting clutch linkage at the outer end of yoke. Pull outward on outer end of yoke enough to allow brushing lubricant on ball. Yokes on all series can be removed from underside to allow fulcrum ball lubrication without removing transmission or release bearing support.

Clutch release bearings are sometimes needlessly replaced in the field because of clutch noise which is diagnosed as "noisy clutch release bearing."

Squeaking and grinding noises are usually caused by heavy friction in the release linkage. The linkage should be lubricated before release bearings are replaced in order to avoid unnecessary service work.

Clutch pressure plate release lever pins can best be lubricated by spraying dry powdered graphite into pressure plate assembly. This does not afford immediate relief but if clutch is operated while engine is running and after lower flywheel pan has been reinstalled, the graphite will work into the bearing surfaces. Powdered graphite will not damage clutch disc facings.

Oil may be used on clutch release lever pins if used very sparingly and care is exercised in preventing oil getting on clutch facings. When oil is used, lubricate each lever separately having flywheel rotated so that each lever is at bottom of flywheel during lubrication. While in this position a small amount of oil may be applied to the sides of lever and allowed to drain down to lever pin while operating clutch pedal.

All of the points listed above are not included in lubrication chart instructions and need be lubricated only when excessive pedal pressure or clutch noise indicates the need for same.

CLUTCH NOISE

If noise is in form of squeaks during pedal operation, follow lubrication procedure outlined under "Clutch Pedal Pressure" section.

Excessive clearance between the clutch pressure plate and clutch cover driving lugs on all present and past models sometimes causes rattle. This rattle occurs only when engine is intermittently accelerated with clutch disengaged and the sound is similar to loose connecting rods or cold pistons. This rattle does not affect clutch operation and no damage will result if left unserviced.

It should not be objectionable, in most cases, because it occurs only under the condition outlined above. However, if complaint warrants correction, the excessive clearance may be removed by using a sharp prick punch to swell the stock at the points where clutch pressure plate cover and pressure plate contact.

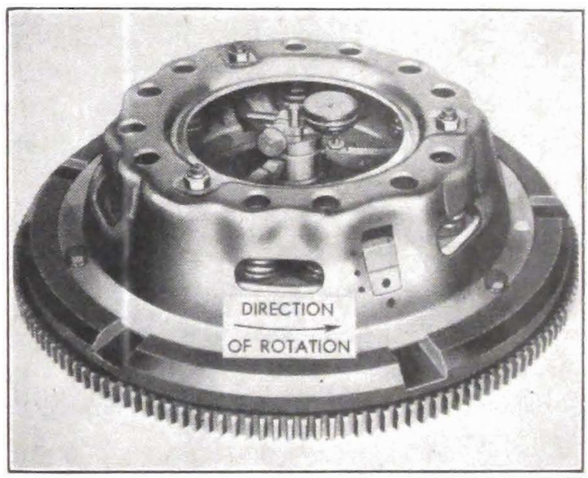


Fig. 6-115

Proceed as follows: (See Fig. 6-115)

1. Remove lower flywheel pan.
2. Hold clutch pedal in disengaged position while using prick punch on trailing edge of each driving lug. *Pedal must be held down to prevent binding clutch in disengaged position.* Three prick punch locations per lug is sufficient. Punch marks should be on trailing edge as this is the point where wear is less likely to occur. Average clearance between driving lugs and cover should be .005" to .008".

CLUTCH CHATTER

A very slight amount of oil on clutch lining will cause clutch grab and chatter. A new driven plate must be installed if original plate contains oil. Removal of oil from lining is not practical. When oil is found on linings examine pilot bearing, transmission drain-back, rear engine bearing and engine oil leaks which might drain into clutch housing past gasket between upper and lower half. It is very important that this gasket provides a good seal.

Pressure plate release levers which are out of adjustment will cause chatter. Adjust as outlined in "Pressure Plate Release Lever" section.

Inspection of transmission steady rest should be made to determine that it is not causing strains on motor mountings because of misalignment. See "Engine Mountings."

CLUTCH DRAG OR FAILURE TO RELEASE

To check for complete release of clutch depress pedal to floor with engine running and shift transmission into low gear. Hold pedal down and shift transmission lever to neutral. If clutch is not completely released the driven plate will begin to spin and gears will clash when again shifted to low gear.

To eliminate clutch drag or failure to release, first check clutch pedal lash and adjustment of pedal return position as outlined in "Clutch Pedal Lash" section. Check clutch linkage for lost motion.

If above procedure does not eliminate drag, remove clutch and check adjustment of pressure plate release levers, on Series 60-70-90 only, clutch driven plate hub for being too tight on clutch gear splines, and run-out of clutch driven plate. These corrections are outlined in Manual Sections on above items.

CLUTCH DRAG

Series 40-50

Complete clutch assemblies are sometimes replaced in service in an effort to overcome dragging or incomplete release. If clutch pedal is lashed to proper limits, and drag occurs when clutch pedal is fully released, the cause can be determined by:

Removing lower flywheel cover and checking with feelers to see if crown spring moves away from clutch cover while clutch pedal is held in released position. See Fig. 6-116.

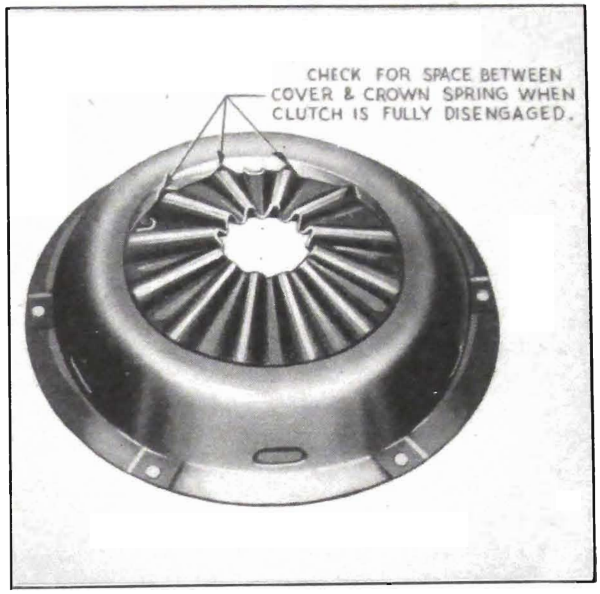


Fig. 6-116. Checking Crown Spring and Cover Clearance

The clutch will not fully disengage if any one of the crown spring contact points fails to rigidly contact cover.

To correct the condition, it will be necessary to remove and disassemble clutch. With clutch cover assembly placed on flat surface, check all six ears where retained springs hook to make sure ears are bent to proper height. Fig. 6-117.

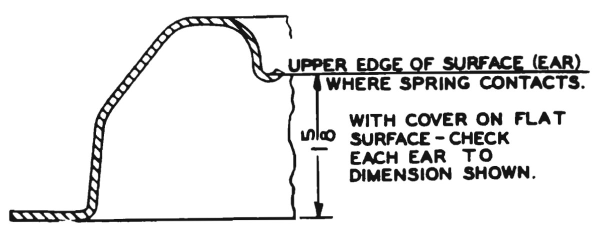


Fig. 6-117. Pressure Plate Ear Location

When installing new retainer springs use service tools J-1039-1 and J-1039-2. Do not stretch spring any further than is necessary to hook loop over ear on clutch cover.

Retainer springs which appear weak or distorted should be replaced. **Retainer springs should always be replaced in complete sets to assure even spring tension.**

In addition to above operations, the clutch driven plate must run true as outlined on page 6-66.

All metal-to-metal contact points of pressure plate assembly should be lightly lubriplated when assembled.

LOW AND REVERSE GEAR CLASH

Gears can be made to clash by shifting into low or reverse gear quickly, after clutch pedal is depressed, even though clutch is in perfect working order. This is because inertia of clutch driven plate causes the plate to spin until it is stopped by friction of transmission and transmission lubricant.

Series 40-50 plates are smaller in diameter and lighter than Series 60-70-90 plates, therefore, Series 60-70-90 plates have more inertia and will spin for a greater length of time after clutch is disengaged. With warm transmission lubricant and low friction transmission bearings, a reasonable amount of spin is to be expected. The spin does not occur when shifting quickly into second or high gear because the synchronizing unit stops the plate when car is not moving.

To eliminate gear clash, sufficient time MUST be allowed before shifting into low after pedal is depressed or else starts must be made in second gear. With the power available in later models there is no objection to making starts in second gear on level ground. The clutch slippage under ordinary driving conditions is not sufficient to produce enough heat to damage clutch linings. Second gear starting also has the advantage of decreasing load on axle gears, rear axle shafts, etc., in wide open throttle starts.

SPECIFICATIONS—ENGINE

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
ENGINE—GEN'L INFORMATION						
Make	Own	Own	Own	Own	Own	Own
Number of Cylinders	8	8	8	8	8	8
Valve Arrangement	In-Head	In-Head	In-Head	In-Head	In-Head	In-Head
Cylinder Arrangement	Cast in Eight	Cast in Eight	Cast in Eight	Cast in Eight	Cast in Eight	Cast in Eight
Bore and Stroke	$3\frac{3}{32}$" x $4\frac{1}{8}$"	$3\frac{3}{32}$" x $4\frac{1}{8}$"	$3\frac{3}{32}$" x $4\frac{1}{8}$"	$3\frac{7}{16}$" x $4\frac{5}{16}$"	$3\frac{7}{16}$" x $4\frac{5}{16}$"	$3\frac{7}{16}$" x $4\frac{5}{16}$"
Piston Displacement	248.0 cu. in.	248.0 cu. in.	248.0 cu. in.	320.2 cu. in.	320.2 cu. in.	320.2 cu. in.
Taxable Horsepower	30.63	30.63	30.63	37.81	37.81	37.81
Compression Ratio—Single Carb.	6.0 to 1	6.0 to 1	—	—	—	—
Compression Ratio—Comp. Carb.	6.3 to 1	6.3 to 1	6.3 to 1	6.7 to 1	6.7 to 1	6.7 to 1
Comp. Pressure at Cr. Speed—						
Single Carburetor	112 lbs.	112 lbs.	—	—	—	—
Compound Carburetion	115 lbs.	115 lbs.	115 lbs.	115 lbs.	115 lbs.	115 lbs.
Cycle	Four	Four	Four	Four	Four	Four
Firing Order	← 1-6-2-5-8-3-7-4 →		← 1-6-2-5-8-3-7-4 →		← 1-6-2-5-8-3-7-4 →	
Engine Wt. (less clutch & trans.) lbs.	705	705	730	856	856	856
Engine Revs. Per Mile at 50 M.P.H.						
With Regular Ratio	3057.4	3179.9	3189.6	2814.4	2941.3	3084.0
With Optional Ratio	—	2963.1	—	—	—	—
Engine R.P.M. at 50 M.P.H.—						
With Regular Ratio	2547.8	2649.9	2658.0	2345.3	2451.1	2570.0
With Optional Ratio	—	2469.2	—	—	—	—
Piston Travel Ft. Per Mile at 50 M.P.H.—						
With Regular Ratio	2102.0	2186.0	2192.9	2022.9	2114.1	2216.6
With Optional Ratio	—	2037.1	—	—	—	—
POWER PLANT MOUNTINGS—						
Number of Suspension Points	Four	Four	Four	Four	Four	Four
Front Mountings—Type	← Vulcanized Rubber →		← Vulcanized Rubber →		← Vulcanized Rubber →	
Rear Mountings—Type	← Vulcanized Rubber →		← Vulcanized Rubber →		← Vulcanized Rubber →	
Steady Rest Mounting—Type	← Vulcanized Rubber →		← Vulcanized Rubber →		← Vulcanized Rubber →	
Location of Front Mounting	← Both Ends of Front Engine Support →					
Location of Rear Mountings	← Between F.W.H. and Transmission →					
Location of Steady Rest Mounting	← Under Universal Joint →					
CYLINDER CRANKCASE—						
Type of Casting	← Block Integral with Crankcase—All Series →					
Main Bearings	← Replacement—Interchange—Complete Sets Only →					
Bearing Material	← Steel Backed Durex →		← Steel Backed Durex →		← Steel Backed Durex →	
Adjustment	Shims	Shims	Shims	Shims	Shims	Shims
Main Bearing Dia. and Length—						
No. 1 Front	$2\frac{5}{16}$ x $1\frac{17}{64}$	$2\frac{5}{16}$ x $1\frac{17}{64}$	$2\frac{5}{16}$ x $1\frac{17}{64}$	$2\frac{9}{16}$ x $1\frac{9}{32}$	$2\frac{9}{16}$ x $1\frac{9}{32}$	$2\frac{9}{16}$ x $1\frac{9}{32}$
No. 2 Front Center	$2\frac{3}{8}$ x $\frac{15}{16}$	$2\frac{3}{8}$ x $\frac{15}{16}$	$2\frac{3}{8}$ x $\frac{15}{16}$	$2\frac{5}{8}$ x $\frac{31}{32}$	$2\frac{5}{8}$ x $\frac{31}{32}$	$2\frac{5}{8}$ x $\frac{31}{32}$
No. 3 Center	$2\frac{7}{16}$ x $1\frac{5}{8}$	$2\frac{7}{16}$ x $1\frac{5}{8}$	$2\frac{7}{16}$ x $1\frac{5}{8}$	$2\frac{11}{16}$ x $1\frac{15}{32}$	$2\frac{11}{16}$ x $1\frac{15}{32}$	$2\frac{11}{16}$ x $1\frac{15}{32}$
No. 4 Rear Center	$2\frac{1}{2}$ x $\frac{15}{16}$	$2\frac{1}{2}$ x $\frac{15}{16}$	$2\frac{1}{2}$ x $\frac{15}{16}$	$2\frac{3}{4}$ x $\frac{31}{32}$	$2\frac{3}{4}$ x $\frac{31}{32}$	$2\frac{3}{4}$ x $\frac{31}{32}$
No. 5 Rear	$2\frac{9}{16}$ x $1\frac{25}{32}$	$2\frac{9}{16}$ x $1\frac{25}{32}$	$2\frac{9}{16}$ x $1\frac{25}{32}$	$2\frac{13}{16}$ x $2\frac{15}{32}$	$2\frac{13}{16}$ x $2\frac{15}{32}$	$2\frac{13}{16}$ x $2\frac{15}{32}$
Thrust Bearing	Center	Center	Center	Center	Center	Center
End Clearance	.004"-.008"	.004"-.008"	.004"-.008"	.004"-.008"	.004"-.008"	.004"-.008"
Bearing Clearance Diametrical	.0007"-.0025"	.0007"-.0025"	.0007"-.0025"	.0007"-.0025"	.0007"-.0025"	.0007"-.0025"
No. and Dia. of Cap Screws—						
Rear Bearing	Two ½"	Two ½"	Two ½"	Four ½"	Four ½"	Four ½"
Other Bearings	Two ½"	Two ½"	Two ½"	Two ½"	Two ½"	Two ½"
Camshaft Bearings—						
Bearing Material	← Steel Backed Babbitt →		← Steel Backed Babbitt →		← Steel Backed Babbitt →	
Thickness of Babbitt	.022"	.022"	.022"	.022"	.022"	.022"
Number of Bearings	5	5	5	5	5	5
Thrust Bearing	← Plate on Front End — All Series →					

SPECIFICATIONS—ENGINE (Continued)

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
Camshaft Bearings—Dia. & Length						
No. 1	2 5/32" x 1 1/8"	2 5/32" x 1 1/8"	2 5/32" x 1 1/8"	2 5/32" x 1 1/8"	2 5/32" x 1 1/8"	2 5/32" x 1 1/8"
No. 2	2 1/8" x 3/4"	2 1/8" x 3/4"	2 1/8" x 3/4"	2 1/8" x 15/16"	2 1/8" x 15/16"	2 1/8" x 15/16"
No. 3	2 3/32" x 1 1/8"	2 3/32" x 1 1/8"	2 3/32" x 1 1/8"	2 3/32" x 1 1/8"	2 3/32" x 1 1/8"	2 3/32" x 1 1/8"
No. 4	2 1/16" x 3/4"	2 1/16" x 3/4"	2 1/16" x 3/4"	2 1/16" x 15/16"	2 1/16" x 15/16"	2 1/16" x 15/16"
No. 5	1 3/4" x 3 1/32"	1 3/4" x 3 1/32"	1 3/4" x 3 1/32"	1 3/4" x 3 1/32"	1 3/4" x 3 1/32"	1 3/4" x 3 1/32"
CYLINDER HEAD						
Material	C. I.	C. I.	C. I.	C. I.	C. I.	C. I.
Type	One Piece	One Piece	One Piece	One Piece	One Piece	One Piece
Combustion Chamber	Cast	Cast	Cast	Cast	Cast	Cast
Number and Size of Bolts	←— Twenty-two—7/16" —→		←— Twenty-two—7/16" —→		←— Twenty-two—7/16" —→	
Number and Size of Studs	None	None	None	None	None	None
FLYWHEEL						
Material	C. I.	C. I.	C. I.	C. I.	C. I.	C. I.
Weight of Flywheel and Ring (lbs.)	36.55	36.55	36.55	44.75	44.75	44.75
Diameter of Flywheel at Ring	13.301"-13.304"	13.301"-13.304"	13.301"-13.304"	14.224"-14.227"	14.224"-14.227"	14.224"-14.227"
Inside of Diameter of Ring	13.293"-13.297"	13.293"-13.297"	13.293"-13.297"	14.216"-14.220"	14.216"-14.220"	14.216"-14.220"
Width of Ring at Teeth	35/64"	35/64"	35/64"	43/64"	43/64"	43/64"
Number of Teeth on Ring	146	146	146	156	156	156
Pitch of Teeth	10-12	10-12	10-12	10-12	10-12	10-12
CRANKSHAFT						
Number of Counterweights	8	8	8	8	8	8
Counterweight Int. or Attached	Integral	Integral	Integral	Integral	Integral	Integral
Weight of Crankshaft (lbs.)	85.5	85.5	85.5	114	114	114
Journals Overlap	Yes	Yes	Yes	Yes	Yes	Yes
Distance to Bottom of Case	2 3/8"	2 3/8"	2 3/8"	2 1/2"	2 1/2"	2 1/2"
HARMONIC BALANCER						
Type	←— Laminated Steel Flywheel Supported on Steel Leaf Springs —→					
Location	←— Front End of Crankshaft —→		←— Front End of Crankshaft —→		←— Front End of Crankshaft —→	
CAMSHAFT						
Camshaft Drive Type	Chain	Chain	Chain	Chain	Chain	Chain
Make of Chain	Link Belt	Link Belt	Link Belt	Link Belt	Link Belt	Link Belt
Width of Chain	1"	1"	1"	1"	1"	1"
Pitch of Chain	.500"	.500"	.500"	.500"	.500"	.500"
Number of Links	49	49	49	50	50	50
Cam Sprocket—						
Material	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Width	1 1/32"	1 1/32"	1 1/32"	1 1/32"	1 1/32"	1 1/32"
Number of Teeth	38	38	38	38	38	38
Crank Sprocket—						
Material	CDS. 1112	CDS. 1112	CDS. 1112	CDS. 1112	CDS. 1112	CDS. 1112
Width	1 1/32"	1 1/32"	1 1/32"	1 1/32"	1 1/32"	1 1/32"
Number of Teeth	19	19	19	19	19	19
VALVE TIMING (Valve .004" off seat)						
Inlet Opens	13 Deg. BUDC.	13 Deg. BUDC.	13 Deg. BUDC.	14 Deg. BUDC.	14 Deg. BUDC.	14 Deg. BUDC.
Inlet Closes	68 Deg. ALDC.	68 Deg. ALDC.	68 Deg. ALDC.	71 Deg. ALDC.	71 Deg. ALDC.	71 Deg. ALDC.
Exhaust Opens	55 Deg. BLDC.	55 Deg. BLDC.	55 Deg. BLDC.	56 Deg. BLDC.	56 Deg. BLDC.	56 Deg. BLDC.
Exhaust Closes	22 Deg. AUDC.	22 Deg. AUDC.	22 Deg. AUDC.	25 Deg. AUDC.	25 Deg. AUDC.	25 Deg. AUDC.
PISTON, PINS AND RINGS						
Piston Material	Cast Iron	Cast Iron	Cast Iron	Al. Alloy	Al. Alloy	Al. Alloy
Piston Features	Cam Ground	Cam Ground	Cam Ground	←— Cam Ground—Trans. Slot —→		
Piston Skirt Type	Full Skirt	Full Skirt	Full Skirt	Full Skirt	Full Skirt	Full Skirt
Piston Surface Treatment	Lubrite	Lubrite	Lubrite	Anodized	Anodized	Anodized
Weight—Piston only (lbs.)	1.528*	1.528*	1.528*	1.178	1.178	1.178
Weight—Pistons, Rings & Pin (lbs.)	1.898	1.898	1.898	1.658	1.658	1.658

***Weight includes bushing weight.**

SPECIFICATIONS—ENGINE (Continued)

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
Piston Length	4 1/4"	4 1/4"	4 1/4"	4 9/16"	4 9/16"	4 9/16"
Ring Groove Depth—						
Compression	.167" Nom.	.167" Nom.	.167" Nom.	.182" Nom.	.182" Nom.	.182" Nom.
Oil Seal	.167" Nom.	.167" Nom.	.167" Nom.	.182" Nom.	.182" Nom.	.182" Nom.
Oil Ring Grooves—Drilled:						
Upper	←— Eight 5/32" Holes —→		←— Eight 5/32" Holes —→		←— Eight 5/32" Holes —→	
Lower	←— Eight 5/32" Holes —→		←— Eight 5/32" Holes —→		←— Eight 5/32" Holes —→	
Piston Clearance—						
Top Land	.0155"-.0225"	.0155"-.0225"	.0155"-.0225"	.0265"-.0335"	.0265"-.0335"	.0265"-.0335"
2rd, 3rd & 4th Lands	.0155"-.0225"	.0155"-.0225"	.0155"-.0225"	.0205"-.0275"	.0205"-.0275"	.0205"-.0275"
Top of Skirt (Paddle Gage Fits)	.0014"-.0020"	.0014"-.0020"	.0014"-.0020"	.0023"-.0029"	.0023"-.0029"	.0023"-.0029"
Top of Skirt (With Mics)	.0017"-.0023"	.0017"-.0023"	.0017"-.0023"	.0026"-.0032"	.0026"-.0032"	.0026"-.0032"
Number of Piston Pin Bushings	2	2	2	None	None	None
Wrist Pin—Length	2 11/16"	2 11/16"	2 11/16"	3 1/16"	3 1/16"	3 1/16"
Wrist Pin—Diameter	.8124"-.8129"	.8124"-.8129"	.8124"-.8129"	.8744"-.8749"	.8744"-.8749"	.8744"-.8749"
Wrist Pin Cleaner at 70° F.	.0003"-.0004"	.0003"-.0004"	.0003"-.0004"	.0003"-.0004"	.0003"-.0004"	.0003"-.0004"
Distance from Pin Cent. to Pist. Top	2.726"	2.726"	2.726"	2.843"	2.843"	2.843"
Wrist Pin Type of Lock	←— Clamp Bolt in Connecting Rod —→					
Is Wrist Pin Offset	No	No	No	No	No	No
PISTON RINGS—Compression						
Number of Comp. Rings Per Cyl.	2	2	2	2	2	2
Type of Ring—Upper Comp.	Notched	Notched	Notched	Notched	Notched	Notched
Lower Comp.	Tapered Face	Tapered Face	Tapered Face	Tapered Face	Tapered Face	Tapered Face
Above or Below Piston Pins	Above	Above	Above	Above	Above	Above
Width—Upper Comp.	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"
Lower Comp.	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"
Thickness—Upper Comp.	.155"	.155"	.155"	.165"	.165"	.165"
Lower Comp.	.135"	.135"	.135"	.145"	.145"	.145"
Side Clearance—Upper Comp.	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"
Lower Comp.	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"
Width of Gap—Upper	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"
Lower	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"
PISTON RINGS—Oil Control						
Number of Oil Rings Per Cylinder	2	2	2	2	2	2
Type of Ring—3rd Groove	←— High Duty—Slotted —→		←— High Duty—Slotted —→		←— High Duty—Slotted —→	
4th Groove	←— High Duty—Slotted —→		←— High Duty—Slotted —→		←— High Duty—Slotted —→	
Above or Below Piston Pin	Above	Above	Above	Above	Above	Above
Width	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"
Thickness	.140"	.140"	.140"	.150"	.150"	.150"
Side Clearance	.0015"-.003"	.0015"-.003"	.0015"-.003"	.0015"-.003"	.0015"-.003"	.0015"-.003"
Width of Gap	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"	.010"-.020"
CONNECTING RODS						
Type	Uniform Wt.	Uniform Wt.	Uniform Wt.	Uniform Wt.	Uniform Wt.	Uniform Wt.
Weight—Upper (lbs.)	——	——	——	.471	.471	.471
Weight—Lower (lbs.)	——	——	——	1.753±.0039	1.753±.0039	1.753±.0039
Weight—Total Assembly	——	——	——	2.224±.0039	2.224±.0039	2.224±.0039
Length—Center to Center	7 5/8"	7 5/8"	7 5/8"	8 1/4"	8 1/4"	8 1/4"
Connecting Rod Bearing—						
Make	Own	Own	Own	Own	Own	Own
Material	Babbitt	Babbitt	Babbitt	Babbitt	Babbitt	Babbitt
Type	←— Centrifugal Cast —→		←— Centrifugal Cast —→		←— Centrifugal Cast —→	
Diameter and Length	2" x 1.212"	2" x 1.212"	2" x 1.212"	2 1/4" x 1.306"	2 1/4" x 1.306"	2 1/4" x 1.306"
Clearance—End Total	.005"-.010"	.005"-.010"	.005"-.010"	.005"-.010"	.005"-.010"	.005"-.010"
Clearance Diameter	.0008"-.0018"	.0008"-.0018"	.0008"-.0018"	.0008"-.0018"	.0008"-.0018"	.0008"-.0018"
Adjustment	Shims—Solid	Shims—Solid	Shims—Solid	Shims—Solid	Shims—Solid	Shims—Solid
Bolts	Two—3/8"	Two—3/8"	Two—3/8"	Two—7/16"	Two—7/16"	Two—7/16"

SPECIFICATIONS—ENGINE (Continued)

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
How are Rods & Pistons Removed?	From above	From above	From above	From above	From above	From above
Type of Rod Split	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
INTAKE VALVE						
Make	←—— Thompson or Rich ——→		←—— Thompson or Rich ——→		←—— Thompson or Rich ——→	
Head Diameter	1 17/32"	1 17/32"	1 17/32"	1 25/32"	1 25/32"	1 25/32"
Seat Angle	45 Deg.	45 Deg.	45 Deg.	45 Deg.	45 Deg.	45 Deg.
Stem Diameter	.3715"-.3725"	.3715"-.3725"	.3715"-.3725"	.3715"-.3725"	.3715"-.3725"	.3715"-.3725"
Stem Clearance	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"	.0015"-.0035"
Stem Length	4 5/16"	4 5/16"	4 5/16"	4 13/32"	4 13/32"	4 13/32"
Valve Lift	.348"	.348"	.348"	.347"	.347"	.347"
EXHAUST VALVE						
Make	←—— Thompson or Rich ——→		←—— Thompson or Rich ——→		←—— Thompson or Rich ——→	
Head Diameter	1 11/32"	1 11/32"	1 11/32"	1 7/16"	1 7/16"	1 7/16"
Seat Angle	45 Deg.	45 Deg.	45 Deg.	45 Deg.	45 Deg.	45 Deg.
Stem Diameter	.3711"-.3719"	.3711"-.3719"	.3711"-.3719"	.3711"-.3719"	.3711"-.3719"	.3711"-.3719"
Stem Clearance	.0021"-.0039"	.0021"-.0039"	.0021"-.0039"	.0021"-.0039"	.0021"-.0039"	.0021"-.0039"
Stem Length	4 3/64"	4 3/64"	4 3/64"	4 7/32"	4 7/32"	4 7/32"
Valve Lift	.342"	.342"	.342"	.348"	.348"	.348"
VALVE GUIDES—Removable	Yes	Yes	Yes	Yes	Yes	Yes
VALVE SPRINGS						
Type	Dual Helical	Dual Helical	Dual Helical	Dual Helical	Dual Helical	Dual Helical
Inner—Valve Open	48-54 lbs.	48-54 lbs.	48-54 lbs.	48-54 lbs.	48-54 lbs.	48-54 lbs.
Inner—Valve Closed	17.5-22.5	17.5-22.5	17.5-22.5	17.5-22.5	17.5-22.5	17.5-22.5
Outer—Valve Open	74-80	74.80	74-80	74.80	74-80	74.80
Outer—Valve Closed	29.5-34.5	29.5-34.5	29.5-34.5	29.5-34.5	29.5-34.5	29.5-34.5
Total—Valve Opened	122-134	122-134	122-134	122-134	122-134	122-134
Total—Valve Closed	47-57	47-57	47-57	47-57	47-57	47-57
VALVE SPRING LENGTHS						
Inner—Valve Open	1 5/16"	1 5/16"	1 5/16"	1 5/16"	1 5/16"	1 5/16"
Inner—Valve Closed	1 21/32"	1 21/32"	1 21/32"	1 21/32"	1 21/32"	1 21/32"
Outer—Valve Opened	1 19/32"	1 19/32"	1 19/32"	1 19/32"	1 19/32"	1 19/32"
Outer—Valve Closed	1 15/16"	1 15/16"	1 15/16"	1 15/16"	1 15/16"	1 15/16"
Are Lifters & Valve Mech. Detach.	Yes	Yes	Yes	Yes	Yes	Yes
VALVE LIFTER						
Type	Piston	Piston	Piston	Piston	Piston	Piston
Diameter	.9975"-.9985"	.9975"-.9985"	.9975"-.9985"	.9975"-.9985"	.9975"-.9985"	.9975"-.9985"
Lifter Springs	None	None	None	None	None	None
VALVE PUSH ROD TUBE						
Outside Diameter	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"
Wall Thickness	.0325"-.0375"	.0325"-.0375"	.0325"-.0375"	.0325"-.0375"	.0325"-.0375"	.0325"-.0375"
VALVE ROCKER ARM SHAFT						
Outside Diameter	13/16"	13/16"	13/16"	13/16"	13/16"	13/16"
Wall Thickness	5/32"	5/32"	5/32"	5/32"	5/32"	5/32"
VALVE LASH—Operating	.015"	.015"	.015"	.015"	.015"	.015"
ENGINE LUBRICATION						
Type	Forced Feed	Forced Feed	Forced Feed	Forced Feed	Forced Feed	Forced Feed
Pressure to:						
Main Bearings	Yes	Yes	Yes	Yes	Yes	Yes
Connecting Rod Bearings	Yes	Yes	Yes	Yes	Yes	Yes
Wrist Pins	No	No	No	No	No	No
Camshaft Bearings	Yes	Yes	Yes	Yes	Yes	Yes
Overhead Valve Mechanism	Yes	Yes	Yes	Yes	Yes	Yes

SPECIFICATIONS—ENGINE (Continued)

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
Timing Gear—Lubrication	Positive	Positive	Positive	Positive	Positive	Positive
Oil Pump—Type	Gear	Gear	Gear	Gear	Gear	Gear
Location of Oil Pump	←Suspended in Sump at Rear Center of Engine→					
Location of Oil Screen	Oil Float	Oil Float	Oil Float	Oil Float	Oil Float	Oil Float
Oil Filter	Yes	Yes	Yes	Yes	Yes	Yes
Location of Oil Filler	←In Valve Rocker Arm Cover→		←In Valve Rocker Arm Cover→		←In Valve Rocker Arm Cover→	
Oil Level Gauge—Type, Location	←Stick on R. Side of Crk/case→		←Stick on R. Side of Crk/case→		←Stick on R. Side of Crk/case→	
Oil Pressure Gauge Make	AC	AC	AC	AC	AC	AC
Oil Pressure Gauge Location	←On Instrument Panel→		←On Instrument Panel→		←On Instrument Panel→	
Oil Pressure Regulator	←Non-Adjustable Spring Valve Type→					
Normal Oil Pressure	45	45	45	45	45	45
Relief Valve Opens at	45	45	45	45	45	45
Type of Oil Drain	Plug	Plug	Plug	Plug	Plug	Plug
Drain Oil (After first 1000 Miles)	2500 to 3000	2500 to 3000	2500 to 3000	2500 to 3000	2500 to 3000	2500 to 3000
Oil Grade Recommended: Use Grade in accordance with anticipated minimum atmospheric temperature—as follows:						
Not lower than 32° F. air temp.	←20-W or S.A.E. 20→		←20-W or S.A.E. 20→		←20-W or S.A.E. 20→	
As low as plus 10° F. air temp.	20-W	20-W	20-W	20-W	20-W	20-W
As low as minus 10° F. air temp.	10-W	10-W	10-W	10-W	10-W	10-W
Below minus 10° F. air temp.	←10-W plus 10% Kerosene→		←10-W plus 10% Kerosene→		←10-W plus 10% Kerosene→	
Capacity of Oil Reservoir—						
Dry Engine	7½	7½	7½	9	9	9
Refill	5½	5½	5½	7	7	7
COOLING						
COOLING CIRCULATION—Type	Water Pump	Water Pump	Water Pump	Water Pump	Water Pump	Water Pump
Water Temperature Control	←Thermostat and By-Pass→		←Thermostat and By-Pass→		←Thermostat and By-Pass→	
Radiator Pressure Control Valve	7#	7#	7#	7#	7#	7#
THERMOSTAT						
Make	Harrison	Harrison	Harrison	Harrison	Harrison	Harrison
Location of Thermostat	←Engine Water Outlet→		←Engine Water Outlet→		←Engine Water Outlet→	
Opening Temperature at Atm. P.	148° F.-155° F.	148° F.-155° F.	148° F.-155° F.	148° F.-155° F.	148° F.-155° F.	148° F.-155° F.
Temp. Therm. Fully Open Atm. P.	173° F.	173° F.	173° F.	173° F.	173° F.	173° F.
WATER PUMP						
Type	←Centrifugal—Ball Bearing—Spring Loaded Seal—All Series→					
Drive—Water Pump & Fan & Gen.	Single Belt	Single Belt	Single Belt	Single Belt	Single Belt	Single Belt
Ratio—W/Pump & Fan to Eng. Sp.	0.92 to 1	0.92 to 1	0.92 to 1	0.96 to 1	0.96 to 1	0.96 to 1
Location of Water Pump	←Front End of Engine at Top→		←Front End of Engine at Top→		←Front End of Engine at Top→	
Impeller Diameter	4¼"	4¼"	4¼"	4¼"	4¼"	4¼"
Shaft Diameter	⅝"	⅝"	⅝"	⅝"	⅝"	⅝"
RADIATOR CORE						
Make	Harrison	Harrison	Harrison	Harrison	Harrison	Harrison
Type of Core	Vee Cellular	Vee Cellular	Vee Cellular	Vee Cellular	Vee Cellular	Vee Cellular
Material in Core	Copper	Copper	Copper	Copper	Copper	Copper
Core Width and Height	18 9/16" x 22⅝"	18 9/16" x 22⅝"	18 9/16" x 22⅝"	18 9/16" x 22⅝"	18 9/16" x 22⅝"	18 9/16" x 22⅝"
Frontal Area—Core—Sq. in.	419.98	419.98	419.98	419.98	419.98	419.98
Core Thickness	2"	2"	2"	3"	3"	3"
Core Cell Size	.222 x .56	.222 x .56	.222 x .56	.20 x .56	.20 x .56	.20 x .56
COOLING SYSTEM CAPACITY						
Less Heater	13 qts.	13 qts.	13 qts.	16¾ qts.	16¾ qts.	——
With Heater	14¼ qts.	14¼ qts.	14¼ qts.	18 qts.	18 qts.	18 qts.
RADIATOR HOSE						
Upper	←1 9/16" Elbow Type→		←1 9/16" Elbow Type→		←1 9/16" Elbow Type→	
Lower—Radiator Outlet	←1 9/16" Elbow Type→		←1 9/16" Elbow Type→		←1 9/16" Elbow Type→	
By-Pass Hose	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"

SPECIFICATIONS—ENGINE (Continued)

ITEMS	SERIES 40-A	SERIES 40-B	SERIES 50	SERIES 60	SERIES 70	SERIES 90
DRAINS—Number and Location	Plug in Block—Cock in Radiator					
FAN						
Diameter of Fan	18"	18"	18"	18"	18"	18"
Number of Blades	4	4	4	4	4	4
Pitch—Outer End	1⅝"	1⅝"	1⅝"	1⅜"	1⅜"	1⅜"
Pitch—Inner End	1⅝"	1⅝"	1⅝"	1¾"	1¾"	1¾"
Fan & Pump Bearing Lubrication	Sealed Ball Bearing		Sealed Ball Bearing		Sealed Ball Bearing	
Fan Blade Spacing	Uneven	Uneven	Uneven	Uneven	Uneven	Uneven
FAN BELT—Type	Vee	Vee	Vee	Vee	Vee	Vee
FUEL PUMP						
Make	AC	AC	AC	AC	AC	AC
Type	AJ—Diaphram Pump Var. Stroke					
Drive	Direct off of Camshaft		Direct off of Camshaft		Direct off of Camshaft	
Location	Right Side Front		Right Side Front		Right Side Front	
FUEL FILTER						
Make	AC	AC	AC	AC	AC	AC
Is Filter a Separate Unit?	No	No	No	No	No	No
HEAT CONTROL						
Type	Thermostatic	Thermostatic	Thermostatic	Thermostatic	Thermostatic	Thermostatic
Location	At Exhaust Manifold Outlet		At Exhaust Manifold Outlet		At Exhaust Manifold Outlet	
CHOKE CONTROL						
Make	Stromberg and Carter		Stromberg and Carter		Stromberg and Carter	
Type	Automatic	Automatic	Automatic	Automatic	Automatic	Automatic
AIR CLEANER						
Make	AC	AC	AC	AC	AC	AC
Type	Heavy Duty Oil-Bath—Cleaner, and Flame Arrester					
Cold Air Inlet	Optional	Optional	Yes	Yes	Yes	Yes
AIR SILENCER—Make	AC	AC	Hayes	Hayes	Hayes	Hayes
INTAKE MANIFOLD						
Material	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Diameter	1³⁄₁₆"	1³⁄₁₆"	1³⁄₁₆"	1⅜"	1⅜"	1⅜"
Number of Intake Ports	Four	Four	Four	Four	Four	Four
EXHAUST MANIFOLD						
Material	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Number of Sections	1	1	2 Manifolds	2 Manifolds	2 Manifolds	2 Manifolds
Number of Exhaust Ports	8	8	8	8	8	8
Location of Lead-Off	Center	Center	Center of each manifold		Center of each manifold	
Exhaust Separate from Intake	Yes	Yes	Yes	Yes	Yes	Yes
CLUTCH						
Make	Buick	Buick	Buick	Buick	Buick	Buick
Type	Dry Plate	Dry Plate	Dry Plate	Dry Plate	Dry Plate	Dry Plate
Make of Discs	Long and B. & B.		Long and B. & B.		Long and B. & B.	
Number of Driven Disc	One	One	One	One	One	One
Number of Driving Discs	1 & Flywheel	1 & Flywheel	1 & Flywheel	1 & Flywheel	1 & Flywheel	1 & Flywheel
Diameter of Driven Discs	10"	10"	10"	10½"	10½"	10½"
Vibration Neutralizer—Type	6 Springs	6 Springs	6 Springs	B. & B.—6 Springs Long—8 Springs	B. & B.—6 Springs Long—8 Springs	
Number of Clutch Pressure Springs	1	1	1	12	12	12
Total Pressure of Springs	1350#	1350#	1350#	1680#	1680#	1680#
Clutch Facing Material	Woven	Woven	Woven	Woven	Woven	Woven
Clutch Facing Diameter—Inside	6"	6"	6"	6½"	6½"	6½"
Clutch Facing Diameter—Outside	10"	10"	10"	10½"	10½"	10½"
Clutch Facing Thickness	.125"±.003"	.125"±.003"	.125"±.003"	.125"±.003"	.125"±.003"	.125"±.003"
Number of Facings Required	2	2	2	2	2	2
Total Frictional Area of Facings	100.6 sq. in.	100.6 sq. in.	100.6 sq. in.	106.8 sq. in.	106.8 sq. in.	106.8 sq. in.
Facings Loose or Riveted	Riveted Two Rows		Riveted Two Rows		Riveted Two Rows	
Clutch Control	Manual	Manual	Manual	Manual	Manual	Manual
Clutch Pedal Pressure	28	28	28	28	28	28
Clutch Pedal Ratio—Average	58.6	58.6	58.6	71	71	71
Clutch Adjustment	¾" to 1"	¾" to 1"	¾" to 1"	¾" to 1"	¾" to 1"	¾" to 1"