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WK-S-6BA-6WAL+

This may be checked by placing a very narrow feeler gauge between the tappet and the valve stem. If the feeler is pinched, the timing is correct; whereas, if the feeler is not pinched, check again to make sure that the piston is on the intake stroke and not on the power stroke. If on the power stroke, turn the engine one complete revolution and check again with the feeler. If the feeler is still not pinched, the timing is incorrect, in which case, the gear cover will have to be removed and the valves retimed.

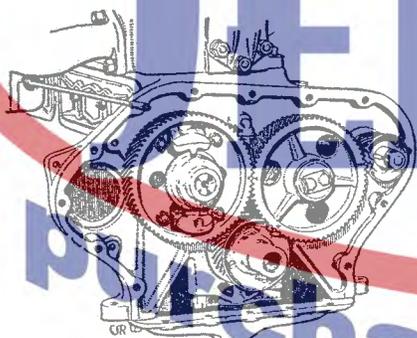
NOTE—The following data are for use when the engine has been entirely disassembled and, either the timing gear marks or the flywheel marks have been obliterated, or if they are not legible.

Intake opens 5 degrees after TDC on engines FC, FCS, FL, FS, BA, BL, BM, BK and BZ.

Intake opens 10 degrees after TDC on engines XAH, XAK, RB and RBR.

Intake opens 8 degrees after TDC on engines MS, ML, MK, MKR, MZ, MZR, SRL, SRLR, SRK and SRKR.

Intake opens at TDC on GAL and GAK engines.



Typical Timing Gear Layout.

For correct valve timing, similarly marked gears should be meshed as shown.

TIMING GEARS

1936-46 ALL: Whenever these gears are removed or disturbed for any reason, it is important that they be assembled so that the similarly marked teeth are meshed, otherwise the valve timing will be incorrect.

NOTE—A typical timing gear layout is illustrated showing the proper arrangement of the several timing gear markings. Note that the "C" marks on the camshaft and idler gears are meshed, while at the same time, the "X" marks on the crankshaft and idler gears, and the "M" marks on the idler gear and the magneto drive gear are all meshed at the same time. In this position, the relationship of the pistons and valves, as well as the ignition, is properly synchronized.

Whenever it becomes necessary to replace the crank and cam gears, suitable puller and pusher equipment is essential, due to the extremely tight fit of these gears

on their shafts. This is particularly important in the case of the camshaft gear because, any attempt to drive on this gear with hammer blows will not only cause damage to the gear but will very likely loosen the welsh plug at the rear camshaft bearing position, resulting in an oil leak. To make assembly of these gears easier, coat the shafts with white lead to prevent galling or sticking.

These front end gears are available in several sizes, the original size being stamped on the gear. A standard size gear is stamped with the letter "S." If the gear is oversize, the stamped mark will be "2S," "4S" and so on up to "10S," in steps of .002". Similarly, undersize gears are stamped with an L following the undersize number, for example, "2L" for .002" undersize.

CAMSHAFT & BEARINGS

1936-46 ALL: Camshaft end thrust is usually controlled by a steel thrust plate bolted to the cylinder block behind the camshaft gear. End play should be held within from .002" to .005" and can be checked by forcing the shaft back to the limit of its end play and inserting a feeler gauge between the thrust plate and the front end of the camshaft.

When necessary to replace bearings, they should be installed in sets and line reamed to provide a clearance within the limits given in the **ENGINE BEARING SPECIFICATIONS** table.

NOTE—On engines having the cylinder block separate from the crankcase, the bearings should be reamed after the cylinder block is bolted to the crankcase to assure proper camshaft fit. Be sure that the oil passage holes are clean and open, and that the oil holes in the bearings are in line with the oil passage hole in the crankcase.

PISTONS & RODS, REMOVE

1936-46 ALL: Piston and rod assemblies are removed from the top of the block on all engines except series XAH and XAK, in which case, they are removed from below. Although regular production rods are marked with the cylinder number in which they are installed, replacement rods are not; therefore, unmarked rods should be suitably identified with punch marks, as removed.

The number of the rod is usually stamped on the lower end of the rod and cap on the camshaft side of the engine and should be installed in this manner.

PISTON & ROD, ASSEMBLE

1936-46 ALL: Aluminum pistons should be assembled to the rods so that when installed in the cylinder bores, the slotted side of the piston is on the side opposite the camshaft.

PISTONS, RENEW

1936-46 ALL: **NOTE**—A variation of 10 degrees between the temperature of the pistons and cylinder bores is sufficient to

produce a difference of .0005". Therefore, both the pistons and cylinder bores should be at normal room temperature (about 70 degrees) when fitting pistons.

Before any attempt is made to fit new pistons, cylinder bores should be carefully indicated and refinished. If the bores do not require refinishing, be sure to remove the ridge at the top of each bore. If refinishing is required, it is good practice to do so in alternate cylinders due to the localized temperature build-up. When refinished, cylinder bores should not be out-of-round or tapered more than .0005".

Before fitting pistons, wipe the cylinder walls and pistons to remove all chips, dirt or other foreign matter. The feeler ribbon used to check piston fit may be about 12" long and 1/2" wide. Consult the **PISTON & RING CLEARANCES** table for the thickness of shim to use as well as the recommended pounds pull on a spring scale required to withdraw the feeler ribbon past the piston.

Insert the piston in the bore upside down and in its running position. Place the checking feeler between the cylinder wall and the thrust side of the piston (opposite the slotted side on aluminum pistons) in a position at right angles to the piston pin hole.

After assembling the piston to the connecting rod, check the assembly for alignment on a suitable jig.

PISTON RINGS, RENEW

1936-46 ALL: **NOTE**—To prevent the possibility of bending or breaking the second ring land—thus ruining the piston—the ridge at the top of the cylinder bore should be carefully cut away before removing the piston and rod assemblies. If the available ridge reamer has no provision to control the depth of the cut, it is good practice to bring the piston far enough up into the cylinder bore to allow the reamer to rest on top of the piston. This will serve to prevent cutting into the ring travel area. Never cut down into the ring travel area more than 1/32"—or more than half the depth of the top ring.

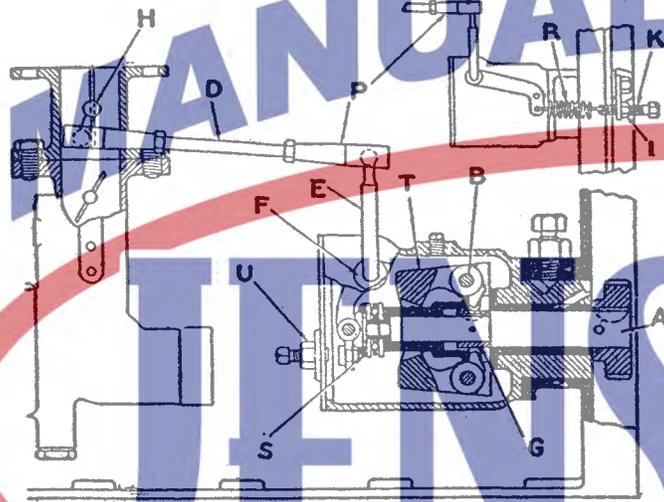
New rings should be fitted with end gaps and groove clearances as given in the **PISTON & RING CLEARANCES** table. Ring grooves must be clean and free from carbon, and must show no perceptible wear.

NOTE—Ring end gaps given in the **PISTON & RING CLEARANCES** table are for cylinder bores without taper. Fit rings in tapered bores with not less than the maximum dimension given. If rings other than standard are being installed, pay particular attention to the installation instructions which usually are included in the ring package. This applies to clearances, position of rings in grooves, etc.

When rings are properly fitted to the pistons, be sure to stagger the ring gaps so they are spaced equal distances around the circumference of the piston, yet having no gaps over the piston pins.

Diagram of governor used on models BA, BL, BM, BK and BZ engines.

A—Governor drive shaft and gear, B—Governor weight hinge pins, D—Governor throttle rod, E—Governor lever, F—Governor lever hinge pin, H—Governor throttle valve, K—Speed adjusting screw, L—Adjusting screw lock nut, P—Throttle rod adjustable ball joint, R—Governor spring, S—Governor ball thrust shift plate, T—Governor weights.



Governor used on engines FCS, FS, FL, FC, XAH and XAK.

A—Governor drive shaft and gear, B—Governor weight hinge pins, D—Governor throttle rod, E—Governor lever, F—Governor lever hinge pin, G—Governor weight support keyed to drive shaft, H—Governor throttle valve, K—Speed adjusting screw, L—Adjusting screw lock nut, P—Throttle rod adjustable ball joint, R—Governor spring, S—Governor ball thrust shift plate, T—Governor weights, U—Stop screw to prevent vamping.

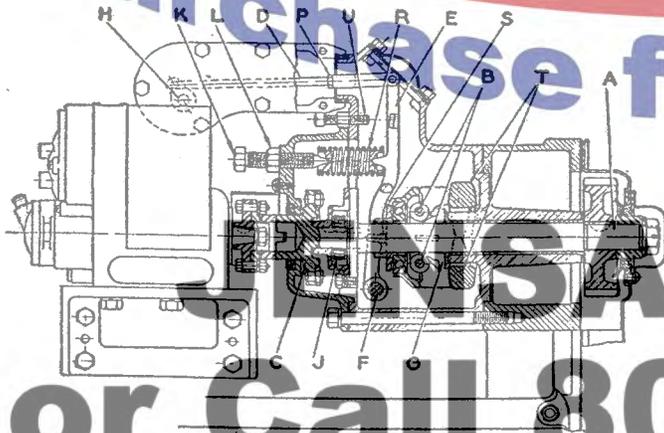


Diagram of Close Regulating Type Governor Used on Models 6-GAL and 6-GAK.

A—Governor drive shaft and gear, B—Governor weight hinge pins, D—Governor throttle rod, E—Governor lever, F—Governor lever hinge pin, G—Governor weight support keyed to drive shaft, H—Governor throttle valve, K—Speed adjusting screw, L—Adjusting screw lock nut, M—Speed adjusting lever, P—Throttle rod adjustable ball joint, R—Governor spring, S—Governor ball thrust shift plate, T—Governor weights.

Diagram of Governor for Overhead Valve Engines.

A—Governor drive shaft and gear, B—Governor weight hinge pins, C—Magneto impulse coupling, D—Governor throttle rod, E—Governor lever, F—Governor lever hinge pin, G—Governor weight support keyed to drive shaft, H—Governor throttle valve rod, J—Magneto impulse coupling spring, K—Speed adjusting screw, L—Adjusting screw lock nut, P—Throttle rod adjustable ball joint, R—Governor spring, S—Governor ball thrust shift plate, T—Governor weights, U—Stop screw to prevent surging.

excessively, new bearings should be fitted and line reamed to fit the crankshaft.

NOTE—Bearings of the precision insert type should be replaced in sets and under no circumstances should any attempt be made to file, alter or otherwise mutilate the bearing caps to obtain proper bearing fit. If the bearing design does not provide for shims, under no circumstances should they be installed in an attempt to obtain a

bearing fit, because the proper "crush" fit in the bearing bores will not be obtained. Similarly, if the bearing design calls for the use of shims, and if the shims are eliminated, the bearings will buckle when the cap bolts are tightened. It is good practice to measure the thickness of shims (if used) and when replacing bearings, do not install more than this thickness. To reduce bearing clearance however, a .001" shim may be removed. Use care to see that these shims do not project between the edges of the bearing shells because they will cause the bearings to buckle when the cap bolts are tightened.

When this type bearing becomes worn, replacement can be accomplished without removing the crankshaft in the following manner: Remove the bearing cap and take out the worn lower shell. A suitable tool can be made to remove the upper shell by

it is good practice to give it a test as directed above.

FUEL SYSTEM

NOTE—For service information on Carburetors, Automatic Chokes, Governors, Fuel Pumps, Air Cleaners and Gasoline Gauges, see the Table of Contents on page 1.

ELECTRIC SYSTEM

NOTE—For service information on Distributors, Magnetos, Generators, Generator Controls, Starting Motors and Starting Switches, see the Table of Contents on page 1.

IGNITION TIMING

1936-46: **NOTE**—Instructions for ignition timing will differ slightly with different makes of electrical equipment, and the following instructions are to be considered general. Firing order on all six-cylinder engines is 1-5-3-6-2-4. On series XAH and XAK, the firing order is 1-2-4-3, while on engines FS, FCS, FL, FC and FCL, the order of firing is 1-3-4-2.

With battery ignition, crank the engine to bring No. 1 piston up on its compression stroke and stop when the "DC" mark on the flywheel is in line with the indicator on the flywheel housing. In this position, the points should just be beginning to open, with the spark retarded and the distributor rotor in the No. 1 firing position.

If equipped with a magneto, crank the engine to bring No. 1 piston up on its compression stroke and stop when the "DC" mark on the flywheel is in line with the indicator on the flywheel housing.

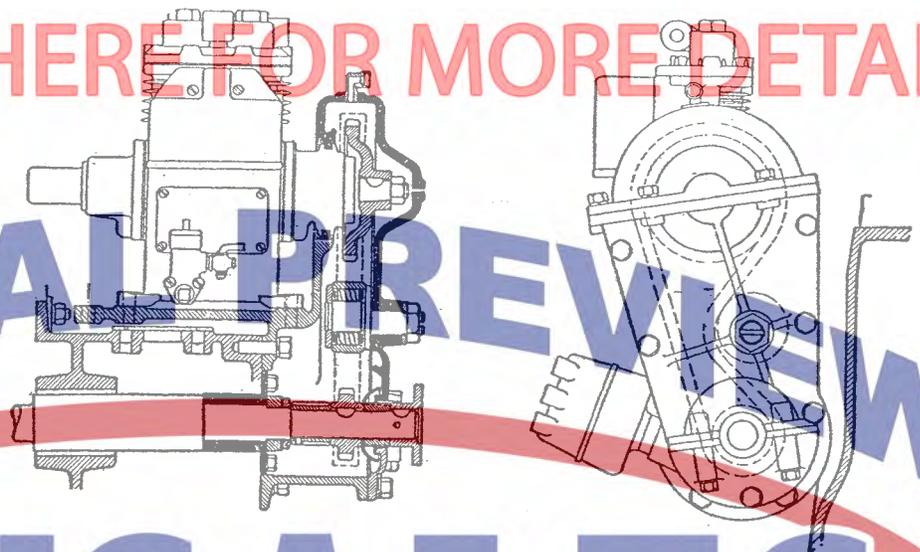


Diagram of chain drive air compressor mounting of early design. Later designs have no idler.

Loosen the coupling connection between the magneto shaft and the engine shaft. Remove the breaker cover and the distributor cover. Move the advance arm to the retarded position—which is when the arm is moved as far as it will go in the direction of rotation. Then turn the magneto in the direction of rotation, until the points just begin to open, being sure the rotor is in line with the proper segment to distribute spark to No. 1 cylinder. With the magneto in this position, connect the coupling flanges and replace the breaker and distributor covers.

NOTE—If the magneto is equipped with an impulse coupling, turn the magneto until the impulse coupling trips, then turn it back until the points close, then forward again until the points just open.

The spark may be advanced or retarded to compensate for the grade of fuel being used. Likewise, certain operating conditions may require either more or less spark advance. For best performance and fuel economy, the spark setting should be one which will provide smooth engine performance with a slight "ping" on wide-open throttle at comparatively low vehicle speed.

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