

Indian

**P4 SERIES ENGINES
50cc and 70cc**

P4—50cc

P4S—50cc

P4SS—50cc

P470—70cc

SERVICE MANUAL

THE
Indian

MOTORCYCLE CO. 1535 West Rosecrans Avenue Gardena, California 90249

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SUGGESTIONS FOR USE

FIRST ENGINE STARTING

Before starting the engine for the first time, make sure that the spark plug is clean; to do this, unscrew the part with the special wrench and check whether any possible oil stowage or other means have soiled the electrodes during the transport or long storage.

Before starting the engine, check that the oil in the transmission is at the right level by unscrewing the screw located on the cover of the right crankcase (see figure, no.1-1). If the oil is at the right level, it will spurt from the hole.

LUBRICATION

To obtain the best engine performance possible, the following instructions must be carried out:

- ENGINE: it is lubricated by the fuel. Apart from the running-in, during which special instructions must be followed, always use a 20:1 mixture.
- CHANGE GEAR AND CLUTCH: these are lubricated in an oil bath. The gear-clutch box contains 650 cc of oil. Usually, SAE 30 should be utilized.

To pour oil into the change gear - clutch box, unscrew the special plug (see figure no.1-4), and its draining is effectuated across the screw plug (see figure no.1-3) that is located on the right side of the engine.

The oil is changed at the following intervals: the first time after 500 miles, the second time after 1,000 miles, and then, every 1,000 miles.

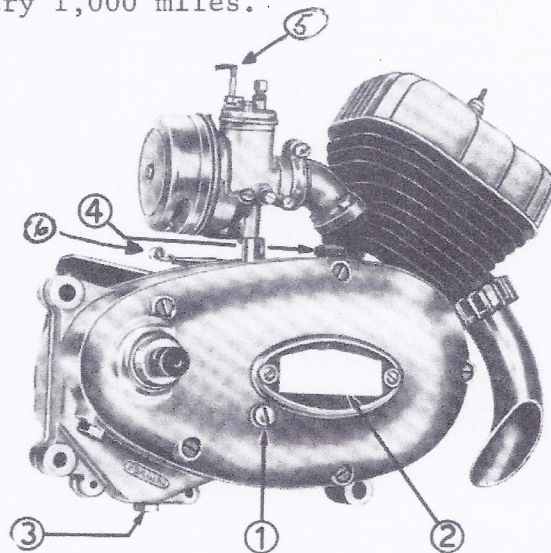


FIGURE NO. 1

Besides changing the oil as described above at the indicated intervals, it is advisable to check the oil level from time to time using the special screw (see figure no.1-1), and to add oil as much as is necessary for it to run out of the level hole, in the event that it is lower than the right level. It is always advisable to change the oil after a prolonged running, so that the oil is hot and will be fluid, due to the heat and will drain out with greater ease.

STARTING

Open the petcock located on the lower part of the tank. If the engine is cold, lower the choke lever located on the carburetor body which will open automatically rotating the twist throttle till it completely stops. Special care should be taken when rotating the twist throttle, if the throttle is not turned completely until the click sounds, which is due to the reopening of the choke, the engine will continue running with a closed starter and thus, it will not reach the R.P.M. necessary for its good working. If the engine is provided with a carburetor model "UA-19-S, or UB-20-S", the starter opening is achieved by pushing the same lever upwards. In the "SPORT" version engine, press two or three times on the float tickler that is located on the float chamber.

RUNNING-IN

So that the engine can produce its maximum power and have a long life, special care is needed during the running-in period.

Therefore, during the first 250 miles, for the "NORMAL" version and 500 miles, for the "SPORT" version, it is essential that the following instructions be complied with:

- 1) Never exceed when in high gear, the speed of 30 + 35 mph for the "NORMAL" version, and 40 + 45 mph for the "SPORT" and "SUPER SPORT" versions, and a proportionally minor speed in the lower gears.

- 2) Avoid going up inclines which have a certain steepness.
- 3) Always engage a lower gear when the engine begins to lug itself.
- 4) For fuel, use an 16:1 mixture of gas and oil. Use a oil prescribed for air cooled or motorcycle 2 stroke engine. Do not use oil for outboard engines or oil for automobile engines.
- 5) Substitute the oil in the change gear, as described in the paragraph under "Lubrication".

STOPPING

Close the gas by rotating the fuel petcock until it is closed. Press the kill button. This contact immediately halts the current going to the spark plug, and thus, immediately stopping the engine running. Then, put the gear lever in neutral position if this has not yet been done already. When parking, before leaving the vehicle, close the fuel cock.

DIFFICULT OR ABSENT STARTING

If the engine runs regularly, starting should always occur without any difficulty even in cold weather. If after several attempts the engine fails to start, check whether:

- 1) The fuel doesn't reach the carburetor:
 - a) the tank is empty
 - b) the fuel petcock is closed

- c) the fuel line is clogged
- d) the air hole on the gas cap is clogged
- e) the carburetor is dirty
- f) the fuel filter in the carburetor is clogged

2) Ignition Lacks:

- a) no spark at spark plug
- b) spark plug is wet
- c) make sure that the spark plug is clean; if it is not so, clean it, if possible, with a metal brush; if the points are too near or too far apart, adjust them to the right distance of .014 - .016.
- d) make sure that the plug rests with its metallic part against the cylinder fins and regularly emits the spark.
- e) check the spark plug cable; if it is broken or badly insulated, change it.

IMPORTANT INFORMATION:

Lighting System

In the front headlight, use a Tungsol 4583 bulb.

In the tail light, use a 1154 bulb.

Attention: Connect the electric wires, that exit out from the lower part of the crankcase, directly to the electrical equipment of the vehicle, and carefully insulate them with electric tape.

Make sure that the wires have not been reversed.

RED WIRE: to the terminal of the external high-voltage coil.

BLACK WIRE: current (light).

BLUE WIRE: to the "STOP" device, or ground.

GENERAL MAINTENANCE

ENGINE

When the regular performance of the engine tends to decrease, this is mainly due to the clogging of the exhaust pipe or silencer, and often, to the carbon deposits that accumulate in the cylinder exhaust ports in the piston crown and head. Therefore, it is advisable to periodically scale the cylinder and the other internal parts of the engine, having recourse, if possible, to the service of a authorized dealer. In any case, never scale the engine without removing the cylinder first and thus, avoiding the danger of damaging the piston and the passage of carbon deposits directly into the crankcase which, at the first engine turnovers, would go up through the transfer ports, causing damage to the cylinder barrel.

When reassembling the head, gradually tighten the nuts passing from one to that directly opposite it. Take care, however, after removing the head, to replace the head and base gasket with a new one since the old one will almost certainly cause leaks under compression.

For the silencer on the contrary, it is advisable to clean it every 2,000 + 3,000 miles.

CLUTCH ADJUSTMENT

The clutch cable and clutch rod must be adjusted, as described, to avoid the premature wear of the cork covered clutch disks and consequently, the clutch slipping.

Make sure, therefore, that the clutch control lever adjuster located on the handle bar, has been backed off all the way. Check for the correct amount of free travel on clutch arm ($1/32 - 1/16$). See figure 1, no. 6.

Remove name plate on right side of engine (see figure 1, no. 2). Loosen nut, using tool U2-11, turn adjusting screw clockwise until it bottoms, and then turn it back one quarter turn or 90° . Hold screw in place, tighten, locking nut, making sure adjustment is not lost on adjusting screw. Then check adjustment on clutch arm, if no FREE play, disconnect cable and recheck clutch rod. Then adjust cable on handle bar to $1/16 - 1/8$, FREE movement on lever. See figure 1, no. 6.

FLYWHEEL MAGNETO

"Contact" adjustment and lubrication - every 2,000 miles, it is necessary to check the "contacts" (platinum points) across the flywheel slits, making sure that, on maximum opening, the distance from one to the other is $.014 + .016$ thousands of an inch.

Whenever, this distance is greater or minor, adjust it in the following manner:

- Loosen slightly the screw which fastens the "stationary contact" plate, move this plate until the correct distance is obtained. Make sure, that the contacts are not oxidized and, if needed, clean them with a sharp-cut file. It is advisable to grease the flywheel "felt", which lubricates the cam, with a limited quantity of lanolin or cam lube.

Inspection and timing - The "contacts" must begin to open before the piston reaches the "top dead center", that is, when the arrow (A) marked on the outside of the flywheel finds itself exactly on the reference arrow marked on the crankcase; in this position, the piston is advanced with respect to the top dead center by 22 mm. on the "SS engine", and 27 mm. on the "Normal", measured on the periphery of the same flywheel, or 3.0 mm. BTC and 2.5 mm. BTC on the normal version. In order to determine the exact contact opening moment, it is advisable to insert a very thin strip of cellophane paper between the contacts and stretch it slightly; then, turn the flywheel slowly along normal rotation direction until the paper is seen coming out of the contacts.

If the two above mentioned arrows are not on the same line at the moment of contact opening, it is necessary to remove the rotating part of the flywheel and to loosen slightly

the three screws which fasten the coil carrying plate in order to permit the necessary plate displacements for obtaining the proper timing. (If timing tester is used, connect one lead to the RED wire, and one lead to the ground).

DISMANTLING

Assuming that the spark plug and the carburetor have previously been removed, proceed as follows:

- 1) After setting the engine block in a vice, remove the four cylinder head nuts with a 10 mm. wrench. Lift off the cylinder head and remove the gasket.
- 2) Lift the cylinder by making it slide along the down studs and remove the base gasket.
- 3) Remove the two gudgeon pin fixing spring rings using long-nose pliers.
- 4) Drive out the gudgeon pin using a suitable drift while supporting the piston on the opposite side. This only refers to the cases in which the special gudgeon extractor, is not available. (See figure below).

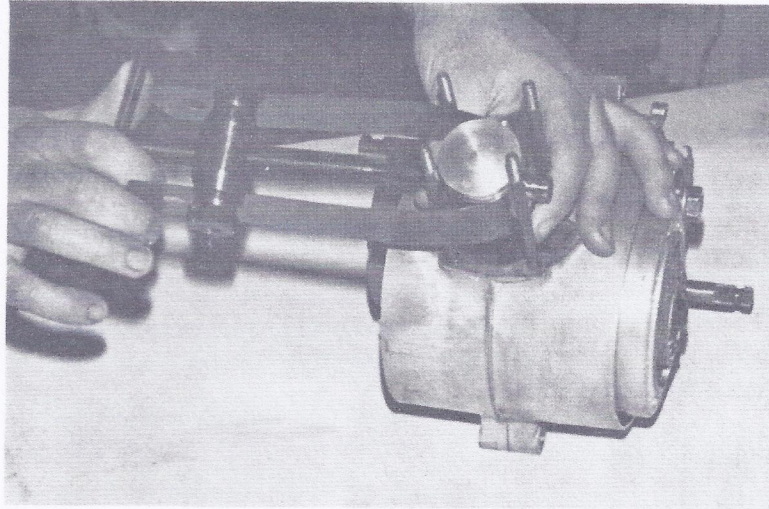


FIGURE 1 - How to remove the gudgeon from the piston using the special tool.

- 5) Remove the two flywheel magneto side cover fixing screws.

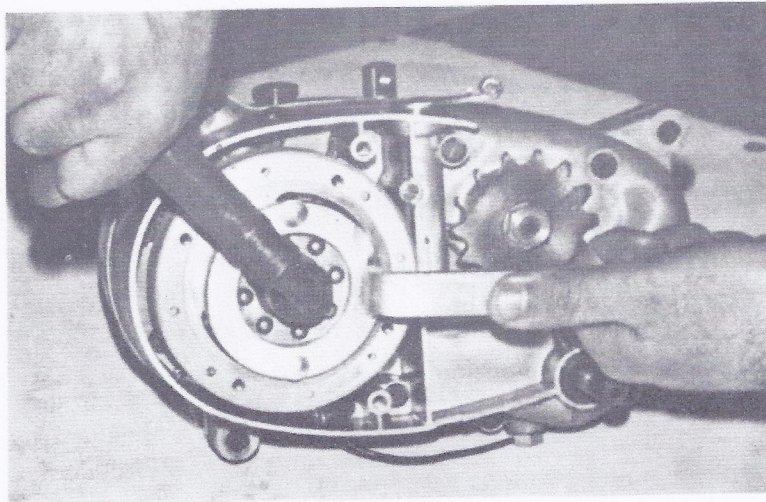


FIGURE 1 BIS - How to hold the flywheel magneto, using the special tool U29-1.

- 6) Using the special flywheel holding tool U29-1, (see figure), unscrew the flywheel retaining nut with a 15 mm. wrench.

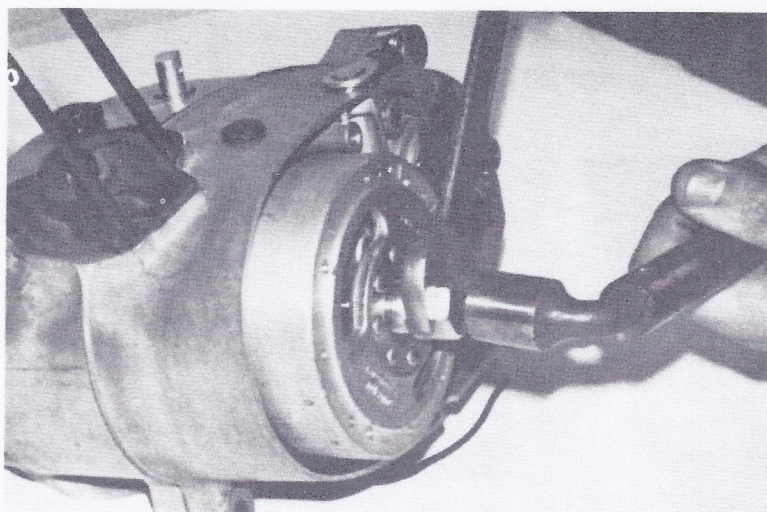
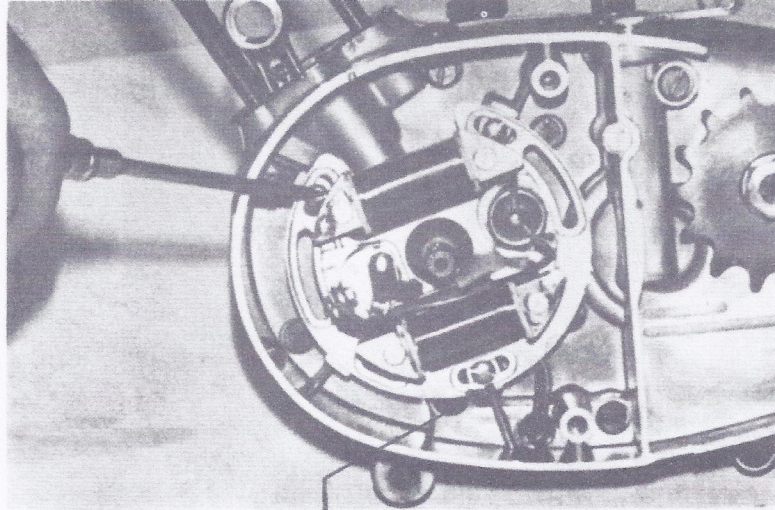


FIGURE 2 - How to remove the flywheel magneto, using special extractor U1-2.

IMPORTANT - USE OF THE EXTRACTOR

Prior to using the extractor, the thread and the internal part of the bolt should be lightly smeared with grease.

- 7) Using the special extractor tool U1-2 screwed into the hub of the flywheel, apply pressure on the center extractor bolt to remove the flywheel magneto.



Scribe Mark

FIGURE 3 - How to determine and scribe ignition timing mark, between the stator board and the crankcase boss.

- 8) Remove the stator plate which is secured to the motor base by three screws. Before removing the stator, make a scribe mark between the stator plate and the crankcase boss to facilitate timing on reassembly. Remove the flywheel locating key from the crankshaft.

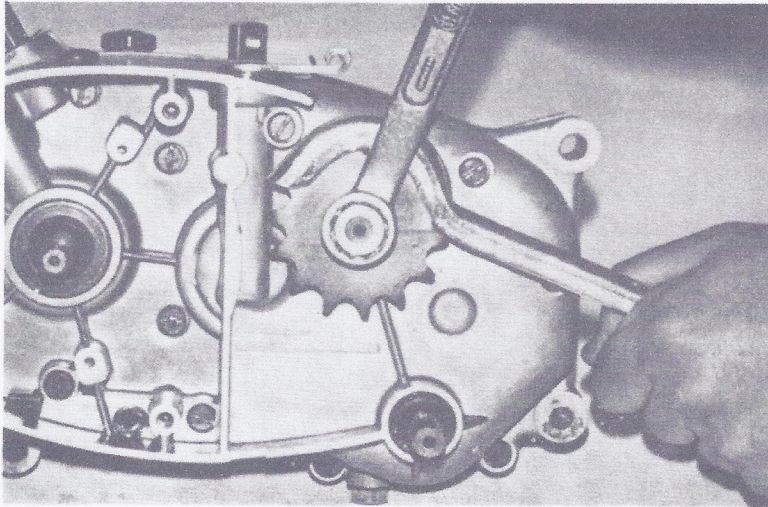


FIGURE 4 - How to hold the counter-shaft, using the tool U2-8.

- 9) Using the special counter-shaft sprocket wrench (see figure), and 17 mm. wrench, remove the sprocket retaining nut and washer.

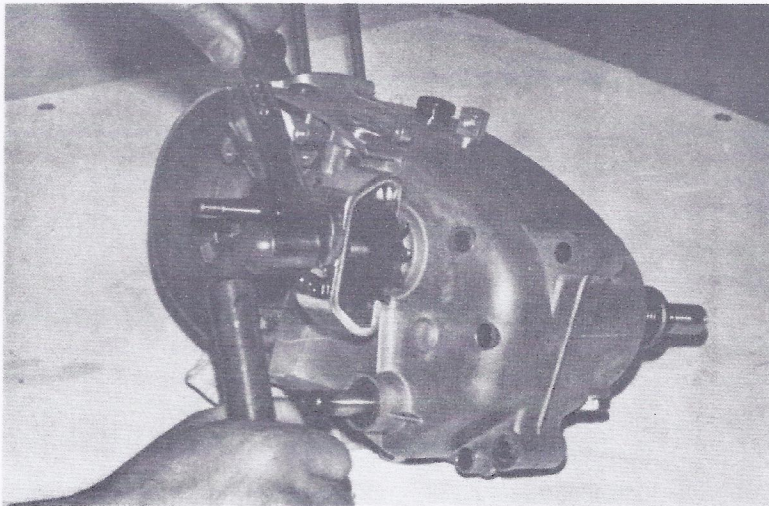


FIGURE 5 - How to remove the counter-shaft sprocket, using the extractor tool U2-3.

- 10) Using the sprocket extractor U2-3, remove the counter-shaft sprocket (see figure 5).

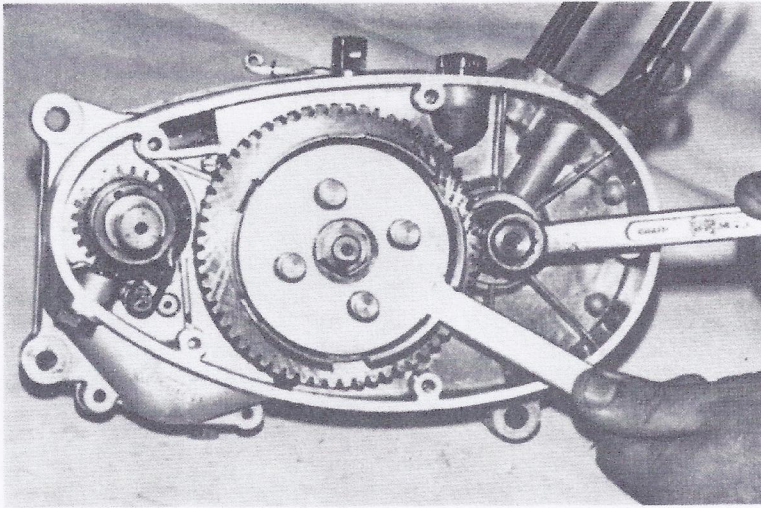


FIGURE 6 - How to remove the engine sprocket nut, using tool U2-6.

- 11) Remove the four clutch spring and disk compressing screws. Using the special wrench U2-6 (see figure 6), remove the engine sprocket nut with 14 mm. wrench.

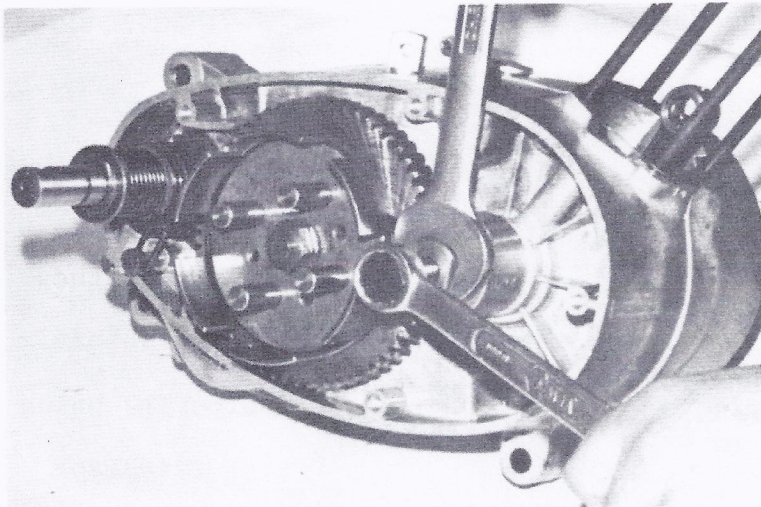


FIGURE 7 - How to remove the engine sprocket, using the extractor U2-4.

- 12) Using the special extractor U2-4, remove the engine sprocket from the shaft (see figure 7). Remove the key from the crank shaft.

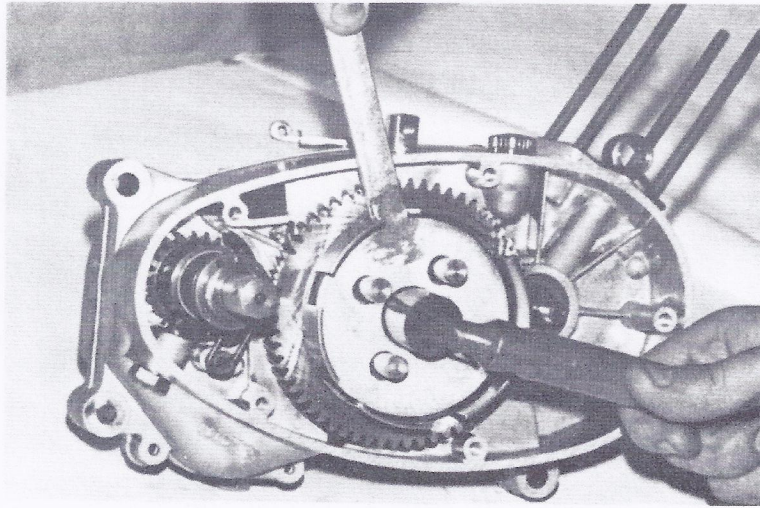


FIGURE 8 - How to remove the clutch stud bearer disk retaining nut, using the special wrench U2-6.

- 13) Using the special wrench U2-6 (see figure), remove the nut with a 17 mm. wrench.

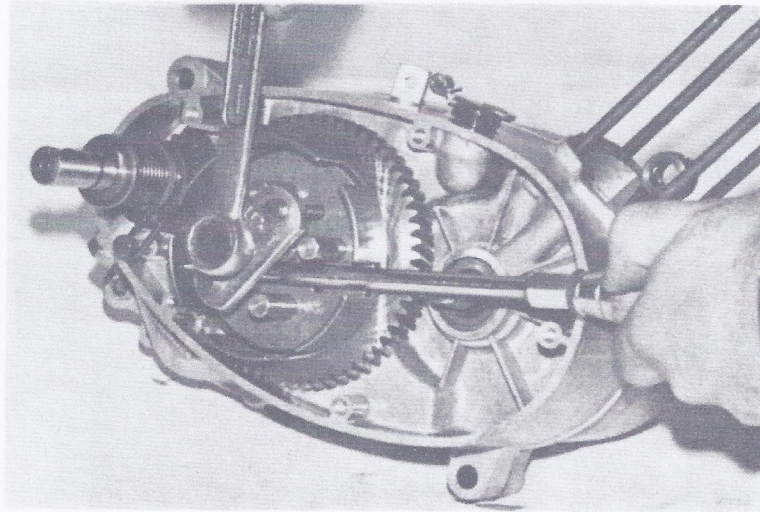
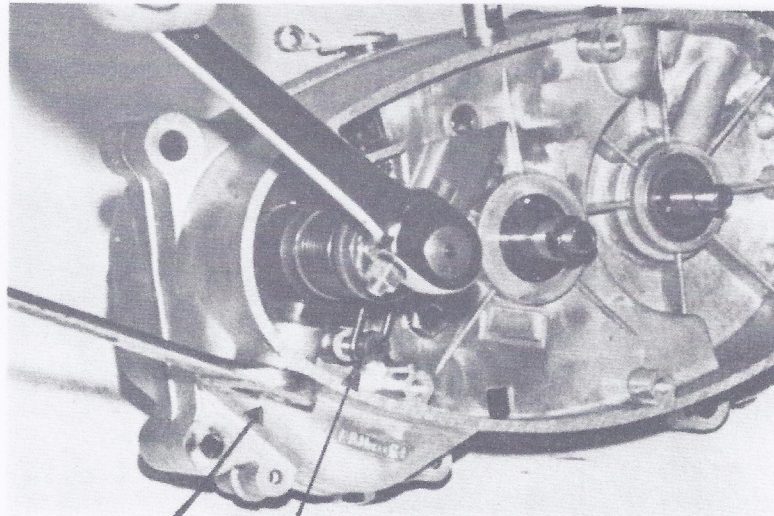


FIGURE 9 - How to remove the clutch stud bearer disk,
using the extractor U2-1.

- 14) Using the special extractor U2-1 (see figure 9), screw the two 6 mm. screws into the "stud bearer disk", turn the central screw clockwise with a 17 mm. wrench until the disk is released from the shaft.

Remove the clutch gear from the shaft. A shim adjustment washer is fitted between the stud bearer disk and the gear. In some engines, a shim adjustment washer is also fitted at the rear of the clutch gear; this is to enable the clutch gear to be accurately lined up with the engine sprocket. The thicknesses of the shim adjustment washers are: 0,2 - 0,6 - 0,8 mm.



Locating Setscrew
Sliding stop bolt

FIGURE 10 - How to remove the kickstarter assembly.

- 15) Attach the kickstarter pedal to the kickstarter shaft, (see figure 10), slightly depress the pedal and remove the sliding stop bolt which is screwed into the crankcase using a 16 mm. wrench. Gradually release the pressure on the kickstarter pedal and remove the kickstarter spring locating setscrew. The complete kickstarter shaft assembly can now be withdrawn from the crankcase.

- 16) Remove the twelve connection screws of the two half crankcases, from the flywheel side half crankcase.

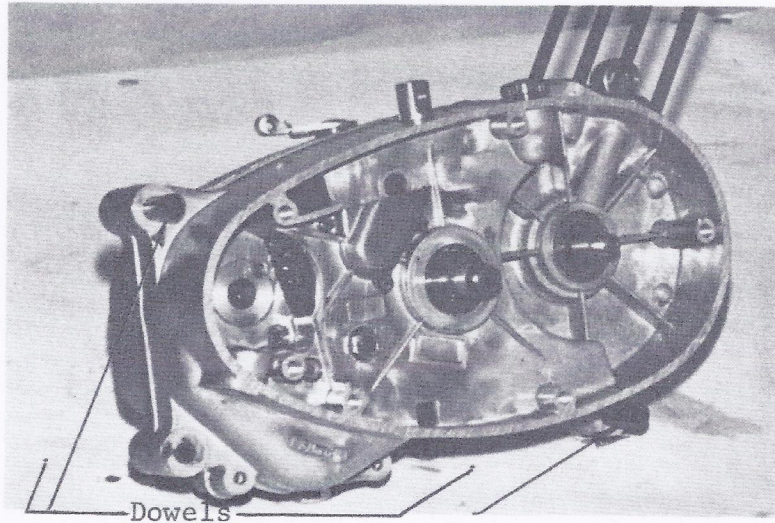


FIGURE 11 - Remove this dowel. A similar dowel is situated in the front engine clamp lug.

- 17) Using a suitable drift, drive out the two dowels positioned in the engine clamp lugs.

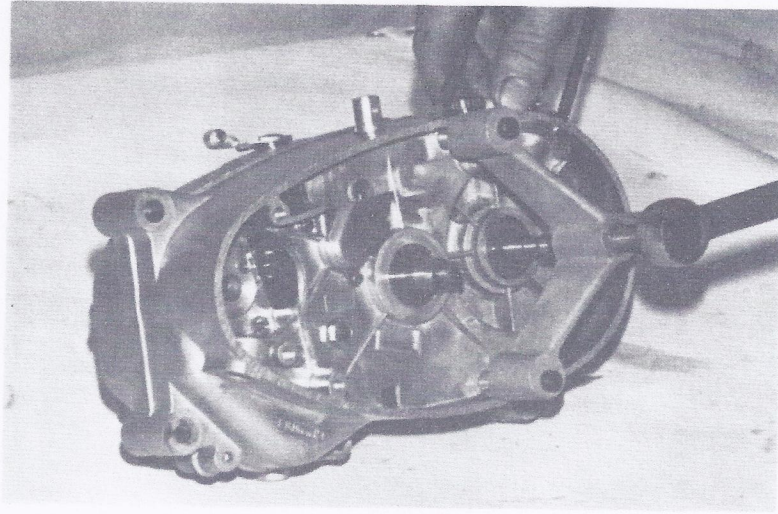


FIGURE 12 - How to separate the two half crankcases,
using the special tool U42-1.

- 18) Using the special "crankshaft extractor tool" U42-1, that is attached to the clutch side half crankcase (see figure 12), screw the central bolt with a 17 mm. wrench and, at the same time, tap with a rubber hammer on the gear shaft until the two half crankcases are fully parted. Then, remove the central washer and the complete primary shaft.
- 19) Remove completely the crankshaft assembly from the flywheel side crankcases by gently tapping on the shaft so as to slip it out of the journal ball bearing. Great care should be exercised during this operation otherwise the shaft will be damaged. A shim adjustment washer may be fitted between the journal ball bearing and the crankshaft on either side, dependant on the tolerances.

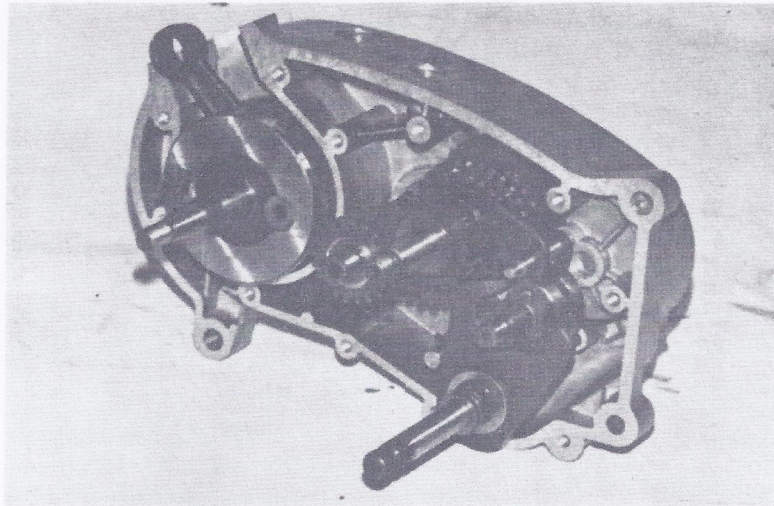


FIGURE 13 - How to release the change gear from the
clutch side half crankcase.

- 20) Remove the primary shaft from the journal ball bearing by tapping gently with a rubber hammer on the same shaft from the clutch side. Then remove, at the same time, the secondary gear shaft, the selector cam and its relative gear selector forks.
- 21) Immediately put the blue steel shim adjustment washers back on their respective shafts.

ASSEMBLY

All the components should be cleaned and lightly oiled before assembly.

Make sure that all the shim adjustment washers are in their right places.

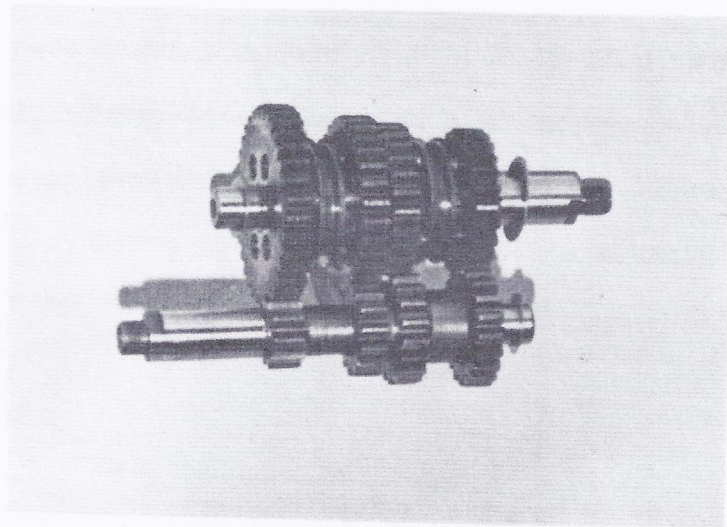


FIGURE 14

During the introduction of the shafts, protect carefully the sealing rings.

- 1) Rest the flywheel side half crankcase on a table, then fit the spring and the speed register ball in their right places.
- 2) Introduce gradually the secondary shaft into the journal ball bearing simultaneously with the gear forks which were already fitted into the clutch sliding parts. Of course, the gear forks should be slipped into their respective guide pins.

Assemble the "selector cam", making sure that the speed register ball is housed in one of the holes on the cam. Fit the fork pin into the cam groove. Then, introduce completely the secondary shaft together with all the parts that are connected to it. (See figure 15).

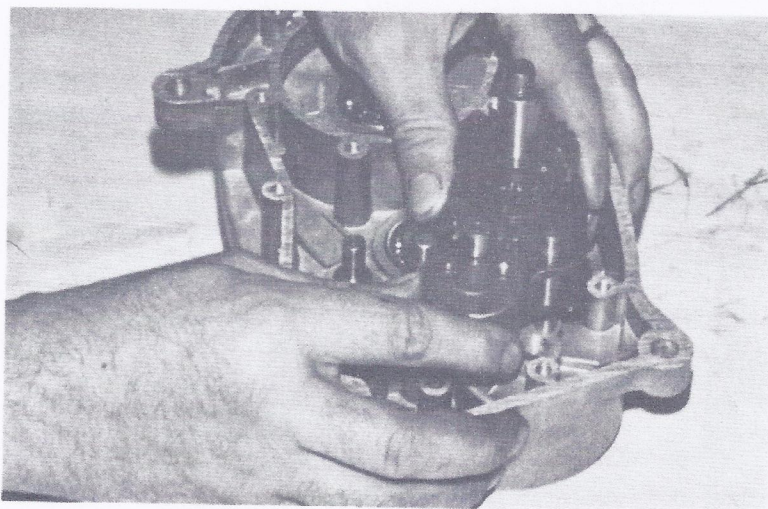


FIGURE 15 - How to assemble the gear secondary shaft, selector cam and forks.

- 3) Replace the primary shaft in its proper place, taking care to place the shim adjustment washer between the bushing and the shaft.
- 4) Replace the complete selector shaft, taking care that the spring return pin enters between the same spring points.
- 5) Fit the left end of the shaft (pin \emptyset 17) that is provided with a shim adjustment washer into the main bearing of the flywheel side half crankcase.
- 6) Make sure that the connecting planes of the two half crankcases are perfectly clean and free from burrs or dings; then mount a washer, new if possible, to avoid oil loss. Superpose the clutch side half crankcase and press in a leveled way for facilitating the closing operation. After the two half crankcase were joined together, make sure that the gear shafts rotate freely. Then, introduce the two dowels into the opposite holes and screw tight the twelve half crankcase connecting screws. Now, make sure for a second time that the crankcase and gear shafts rotate freely and that they present the correct end play.

It is admitted an end play of 0,1 mm. on the crankcase shaft and on the two gear shafts.

- 7) When assembling the clutch gear, make sure that the shim adjustment washer is placed at the rear of it in order

to obtain a correct alignment of the gear with the "engine sprocket"; the special shim adjustment washer should also be placed when assembling the "clutch stud bearer disk".

- 8) Introduce the clutch rod, entering the rounded end into the hole of the primary shaft first, then, introduce the 3/16" steel ball and, finally, the disk thrusting point. Replace the clutch disks in their correct order; when assembling the four springs, fit them into the opposite clutch screws on the side with the smallest hole diameter; then, screw completely and in an evenly way the four clutch screws; lastly, check that the clutch lever play is about 3 mm. that is measured in the wire connection position. The adjustment will be obtained with the adjusting screw and nut that is placed on the terminal clutch disk, using the special wrench U2-11 (see figure 16).

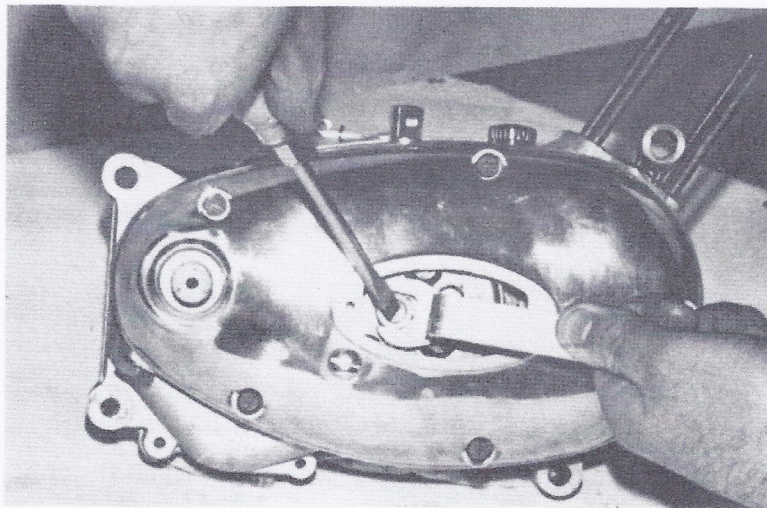


FIGURE 16

- 9) Refit the kickstart gear in its opposite place on the clutch side half crankcase and replace the kickstarter shaft completely assembled.

Fit the return spring anchor screw (6 mm. x 30 mm.).

Turn the kickstarter shaft in an anti-clockwise direction to apply pressure on the spring. Screw tightly the ratchet stop bolt and the washer. (See figure 10).

- 10) After having checked the clutch cover resting face, mount the cover gasket (if possible, a new one), then, mount the cover, screwing tightly the screws.

HOW TO REPLACE THE PISTON

- 11) When mounting the piston, use if possible, a gudgeon pin assembling tool; if this suitable tool is not available, the gudgeon pin should be lightly introduced into the piston using a soft metal drift while supporting the opposite side of the piston with your hand. Refit the gudgeon stop rings and the piston rings on the piston.

IMPORTANT - The piston should be assembled on the connecting rod with the piston ring locating pegs facing the exhaust port.

The clearance between the piston diameter and the cylinder bore diameter, should be 0,09mm. .0015 tho.

HOW TO REPLACE THE CYLINER

- 12) Fit a new oiled gasket on the cylinder base face. Sprinkle an oil film on the inside surface of the cylinder, and while compressing the piston rings by hand, fit the piston into the cylinder sliding the cylinder along the down studs until its base rests on the crankcase.

IMPORTANT - Push the cylinder into its seat and turn the engine over, checking that it rotates freely.

HOW TO REASSEMBLE THE CYLINDER HEAD

- 13) Place the new cylinder head gasket in its position and reassemble the head. When torqueing the head, torque the head nuts evenly, (8 ft. lbs.).

IMPORTANT - Make sure that the head is mounted in the right direction, that is, with the external divergent fins facing towards the gas exhaust.

HOW TO REASSEMBLE THE FLYWHEEL MAGNETO

- 14) Fit the flywheel magneto key in its position in the crankshaft. Thread the stator wires through the grommet housed in the crankcase compartment (a little oil on the end of the wire will facilitate this operation). Place the stator in its position in the crankcase compartment and replace the fixing screws but do not tighten the screws at this stage.

Rotate the flywheel by hand in an anti-clockwise direction until the contacts can be seen to be fully open, check and, if necessary, reset the contact breaker gap again which should be in the range of .014 + .016 tho.

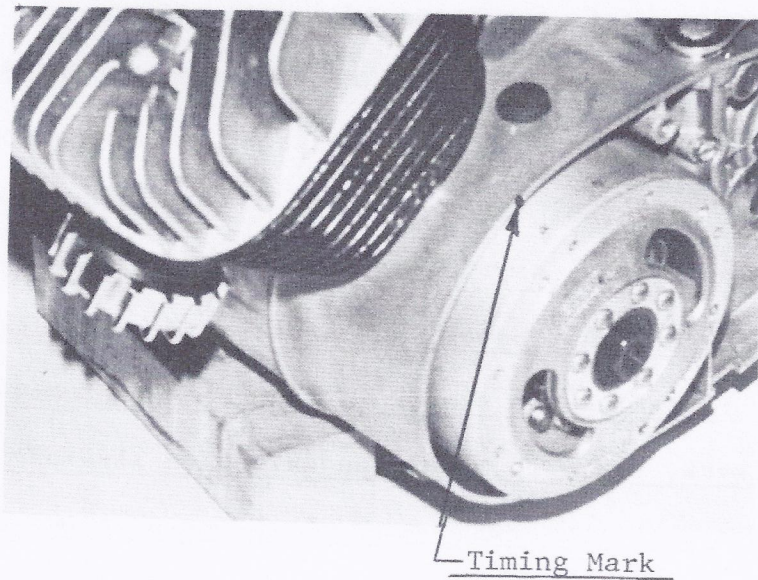
The correct contact breaker gap setting is essential before the ignition timing operation can be carried out. When replacing the stator in the crankcase compartment, it is necessary to match the reference line on the stator with the scribe mark on the crankcase that was made during the dismantling operation.

HOW TO ADJUST THE SPARK ADVANCE (timing)

- 15) The P4-SPORT engine is correctly timed when the trembler contacts just begin to open at 2.5 mm., (2.0 mm. for NORMAL version), before the piston reaches the top dead center. To permit a correct spark advance control, two reference marks are printed on the flywheel periphery. (See figure 17).

When the flywheel is viewed from the front with the marks visible at the top, the first line "A", indicates the advance position, whereas, the second line "O", indicates the top dead center position, that is, when either line coincides with the small chisel mark on the crankcase housing.

FIGURE 17 - When these marks are aligned, the contacts should begin to open.




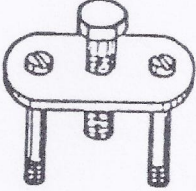
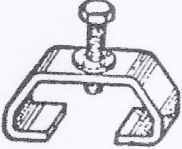





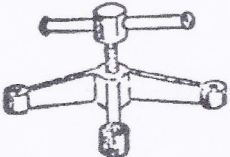
TO CHECK ADVANCE - slowly revolve the flywheel by hand in an anti-clockwise direction and observe the position of the first mark on the flywheel in relation to the small mark on the crankcase, when the contacts commence to open. As previously said, the advance will be correct when the two marks are in line. If the opening of the contacts occurs before the marks are in line, the advance is excessive and it will have to be corrected by turning the stator slightly in an anti-clockwise direction. To do this, it will be necessary to remove the flywheel, slacken the three stator retaining screws and move the plate in the required direction. Retighten the screws, replace the

flywheel and make a further check. When the correct adjustment has been obtained, lock tight the flywheel with the opposite wrench (see figure 1). 10 Ft. lbs. on flywheel nut.

HOW TO REASSEMBLE THE COUNTER-SHAFT SPROCKET

- 16) Place the sprocket on the shaft, making the sprocket hole coincide on the shaft; replace the washer and nut and tighten while holding the sprocket with the special wrench U2-8. 20 Ft. lbs. torque on counter-shaft nut.
- 17) Finally replace the flywheel cover, spark plug and carburetor. Refill the gear box with 650 cc of SAE 30 grade oil. Check whether the oil is at the right level by unloosening the "oil level screw", placed on the clutch side of the cover.

Special tools for use on the Indian Minarelli engines.

	<u>Part No.</u>	<u>Description</u>
	U1-2	Magneto puller
	U2-1	Clutch puller
	U2-3	Sprocket puller
	U2-4	Primary gear puller
	U2-6	Clutch holder wrench (50 c.c.)
	U38-2	Clutch holder wrench (70 c.c.)
	U2-8	Sprocket holder (50 c.c.)
	U2-10	Sprocket holder (70 c.c.)
	U2-11	Clutch nut wrench (50 c.c.)
	U38-3	Clutch nut wrench (70 c.c.)
	U29-1	Magneto spanner
	U42-1	Crank shaft puller



