INDEX

PART A. CARBURETION

Chapter 1. Operation
Section 1. Metering Systems
Section 2. 0-1/8 Throttle
Section 3. 1/8-1/4 Throttle.
Section 4. 1/4-1/2 Throttle.
Section 5. 1/2-3/4 Throttle.
Section 6. 3/4-Full Throttle.
Section 7. Float Metering-Device

Chapter 2. Adjustment
Section 1. Rough Tuning Section
Section 2. Fine Tuning

PART B. ENGINE

Chapter 1. Disassembly
Section 1. Removing the Engine
Section 2. Removing the Piston
Section 3. Stripping the Magneto-Side Engine-Case
Section 4. Stripping the Primary-Side Engine-Case
Section 5. Splitting the Engine Cases
Section 6. Removing the Gearbox Components
Section 7. Removing the Countershaft Assembly

Chapter 2. Crankshaft Assembly
Section 1. Removing the Crankshaft Assembly
Section 2. Repairing the Crankshaft Assembly
Section 3. Installing the Crankshaft Assembly

Chapter 3. Gearbox
Section 1. How the Gearbox Works
Section 2. Reassembling the Gearbox

Chapter 4. Engine Reassembly
Section 1. Assembling the Engine Cases
Section 2. Assembling the Primary-Side Components
Section 3. Finding the Piston Clearance
Section 4. Fitting a New Liner
Section 5. Assembling the Top-End Components
Section 6. Assembling the Magneto-Side Components
Section 7. Installing the Engine

PART C. ELECTRICS

Chapter 1. Operation

Chapter 2. Tests

PART D. FRONT FORKS

Chapter 1. Changing Oil

Chapter 2. Disassembling the Forks

Chapter 3. Disassembling the Steering

Chapter 4. Reassembling the Steering

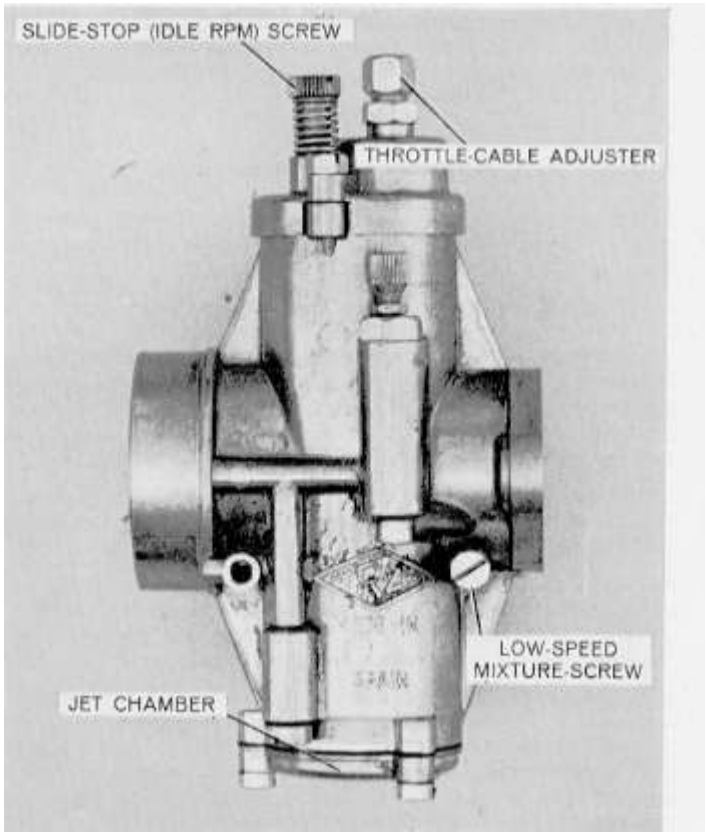
Chapter 5. Reassembling the Forks

PART A

Chapter 1. OPERATION

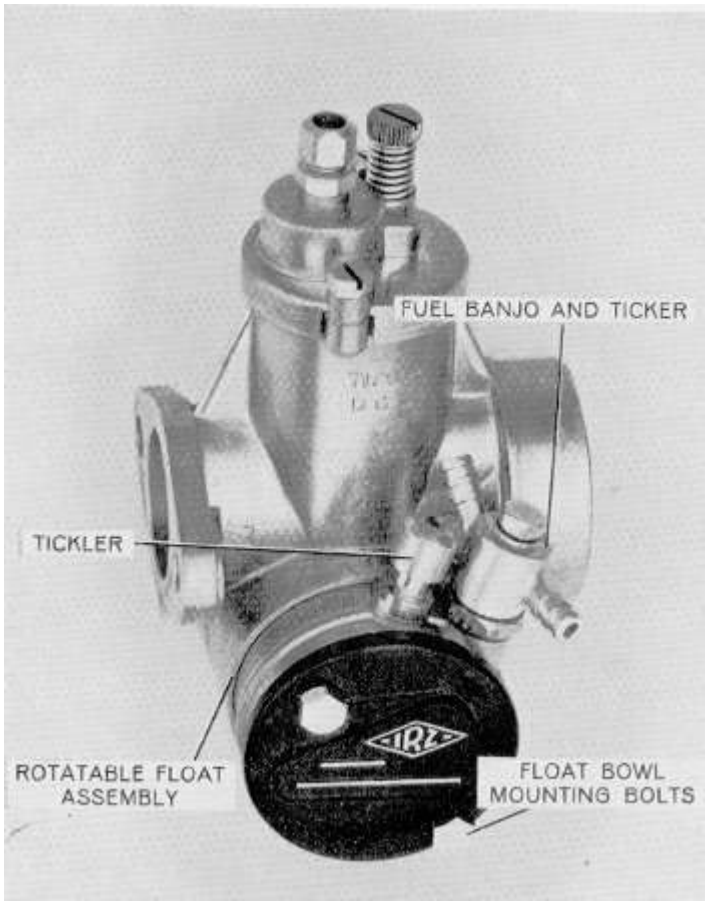
Chapter 1 describes the operation of the IRZ Model DG carburetor.
Chapter 1 contains the following:

Section 1. Metering Systems.
Section 2. 0-1/8 Throttle: The Pilot Metering System.
Section 3. 1/8-1/4 Throttle: Slide Cutaway and 1st-Needle Metering System.
Section 4. 1/4-1/2 Throttle: Slide and Ist-Main-Jet Metering System.
Section 5. 1/2-3/4 Throttle: Slide Cutaway and 2nd-Needle Metering System.
Section 6. 3/4-Full Throttle: Slide and 2nd-Main-Jet Metering System.
Section 7. The Float Metering Device.



2. The carburetor provides the engine with a proportional mixture of fuel and air. If there is proportionally too much air in the mixture, the result is a "lean" mixture. A lean mixture bums too fast, and it may even explode, or detonate. Detonation is indicated by a characteristic "pinging" or rattling sound. Detonation can result in seizing or burning a hole in the piston.

3. If there is proportionally too much fuel in the combustion mixture, the result is a "rich" mixture. A rich mixture bums too slowly to develop much power. When the mixture is extremely rich, the engine does not get enough air to fire on each revolution. When this happens the engine exhaust sounds are similar to those made by a four stroke engine.


FUEL BANJO AND TICKER
TICKLER
ROTATABLE FLOAT ASSEMBLY
FLOAT BOWL MOUNTING BOLTS

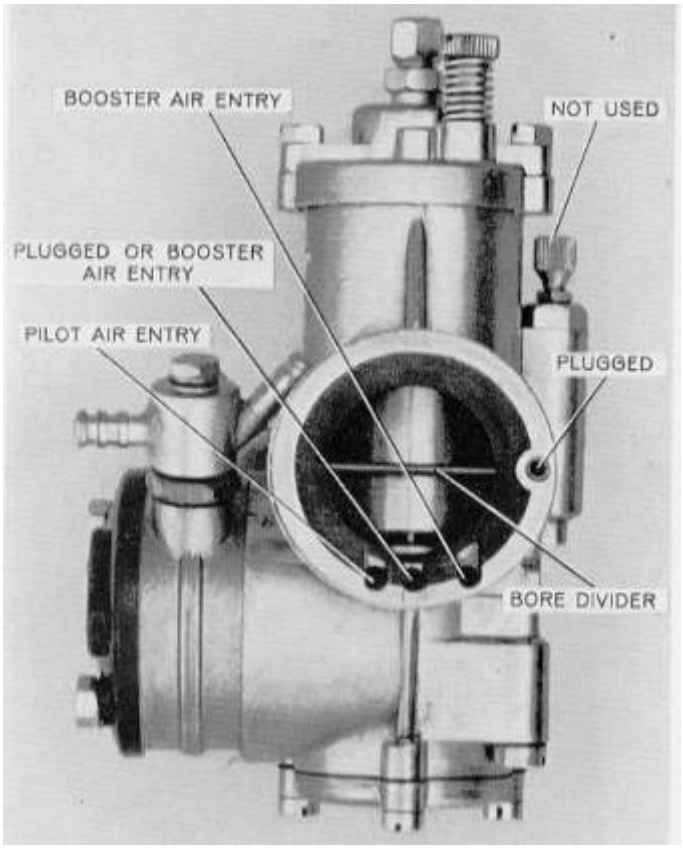
Section 1. Metering Systems.

1. When the flow of fuel or air in a carburetor is regulated, this regulation is called "metering".

2. A metering system consists of an air metering device and a fuel metering device.

3 It is not practical to build a carburetor that has only one metering system to regulate the flow of fuel and air from closed throttle to wide-open throttle. Therefore, each carburetor has several metering systems, to regulate air and fuel flow in different ways at different throttle openings.

4. The 1967 230 cc OSSA motorcycles are fitted with the IRZ Model DG carburetor, with a bore of 29 mm or 32 mm, depending upon the OSSA model. The DG is a progressive carburetor, in which each metering system works in conjunction with those preceding it.



Section 2. 0-1/8 Throttle: The Pilot Metering System.

1. The pilot metering system feeds fuel and air from 0-1/8 throttle. Fuel is metered by the pilot jet and the low speed mixture screw. Air is metered by the throttle slide.

2. When the throttle is closed, and the engine is idling, the movement of the piston creates a vacuum in the bore of the carburetor behind the slide. This vacuum causes air to be sucked in through the small left-hand hole beneath the mouth of the carburetor. The air travels through a pilot mixing chamber at the rear of the carburetor. This

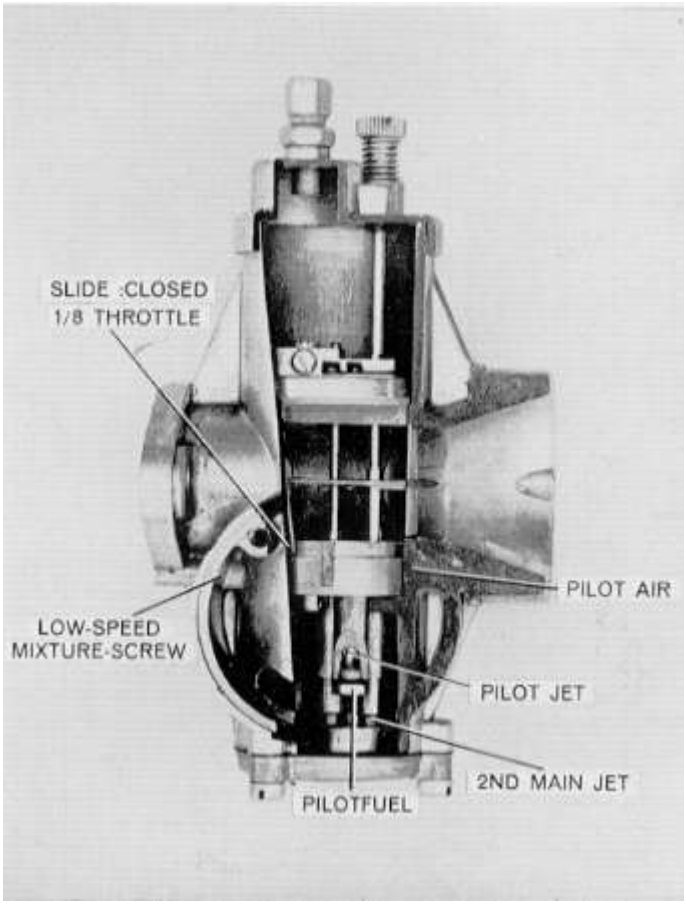
passage of air through the mixing chamber creates a vacuum in a fuel line that is connected with the mixing chamber.

3. The vacuum in the fuel line causes fuel to be sucked up through the 2nd main jet, across to the pilot jet, and up to the pilot mixing chamber. Here the fuel is mixed with air to form tiny droplets.

4. The air and fuel flow past the low speed mixture screw. From there, when the throttle is completely closed, the air fuel mixture enters the carburetor bore through a tiny hole in the bottom of the bore behind the slide. The fuel-and-air mixture then enters the engine.

5. When the throttle is opened, the pilot mixture can also enter the carburetor bore through a larger hole in the bottom of the bore of the jet block. As the slide is raised, the passage of larger amounts of air through the bore increases the vacuum across the mouths of the two pilot fuel holes in the bottom of the bore, which increases the flow of fuel to those holes.

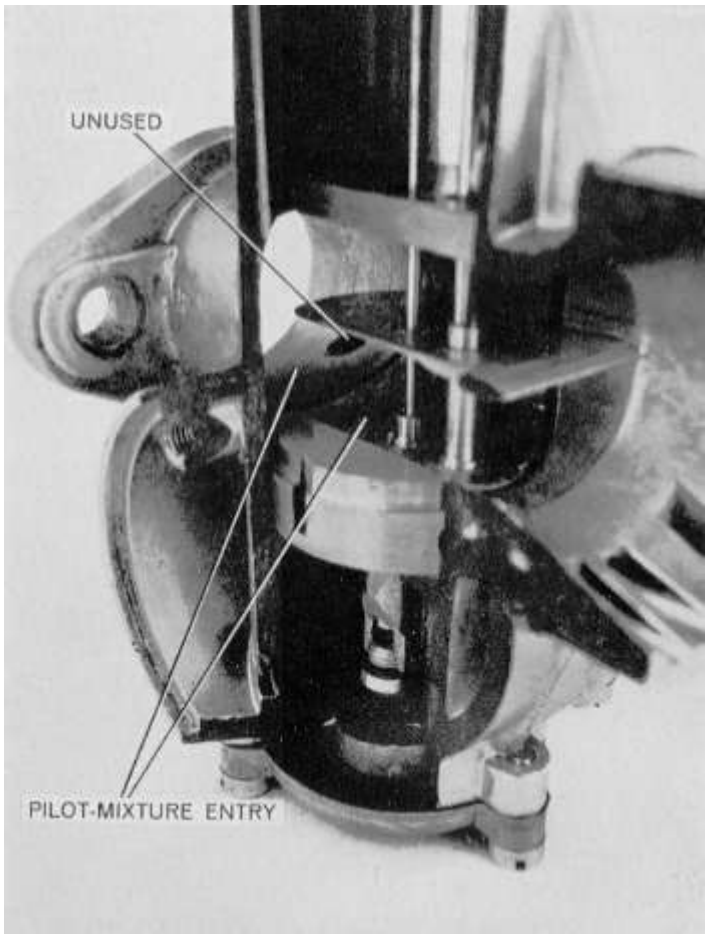
6. You can vary the proportion of the mixture from 0 to 1/8 throttle (either by changing the pilot jet which is seldom necessary), or by adjusting the low speed mixture-screw beneath the mounting flange on the right side of the carburetor. Rotate the screw clockwise to make the mixture leaner; rotate the screw counterclockwise to richen the mixture.



7. Correct adjustment of the pilot metering system is as important to a competition engine as it is to a street or trail machine. Even though you do not want the scrambler

engine to idle when the throttle is closed, you should still make certain that the pilot metering system is adjusted correctly, or the engine may hesitate badly when you grab a handful coming out of a corner.

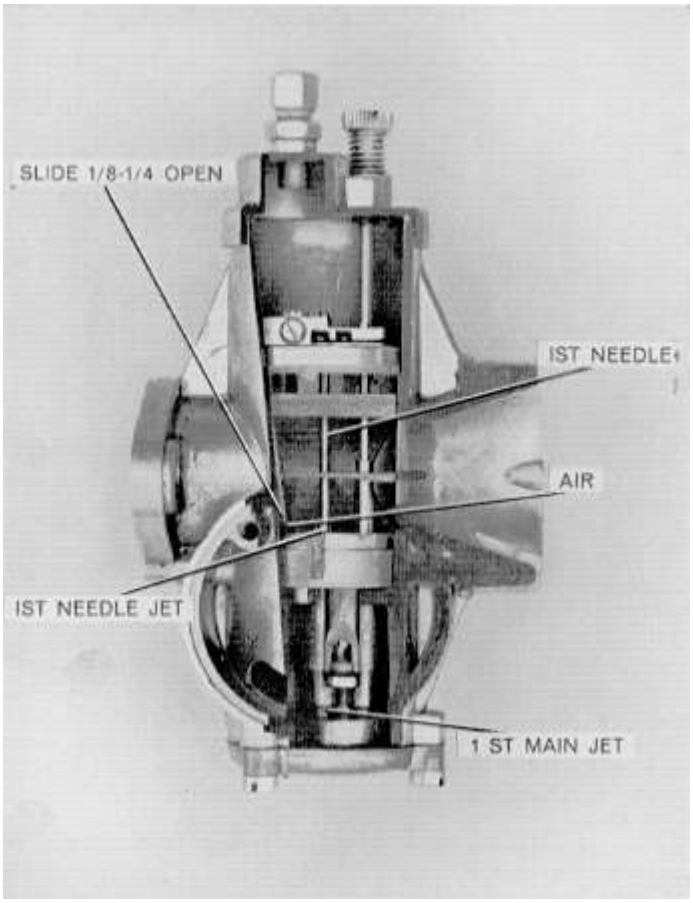
8 The pilot metering system continues to work in conjunction with other metering systems at wider throttle openings, although its influence is greatly decreased.



Section 3. 1/8-1/4 Throttle: Slide Cutaway and Ist Needle Metering System.

1. The flow of air is regulated by the slide cutaway, which also affects the flow of fuel. The flow of fuel is also regulated by the size of the needle jet and the taper of the needle.

2. As the slide is raised, air flows past the mouth of the spray nozzle in the bottom half of the bore. If the air could flow squarely across the top of the spray nozzle, it would create considerable vacuum in the spray nozzle, therefore sucking too much fuel out ofit. For that reason, the front of the slide is cut away, so as to direct air downward against the mouth of the spray nozzle, decreasing the amount of vacuum formed, and decreasing the amount of fuel flow.

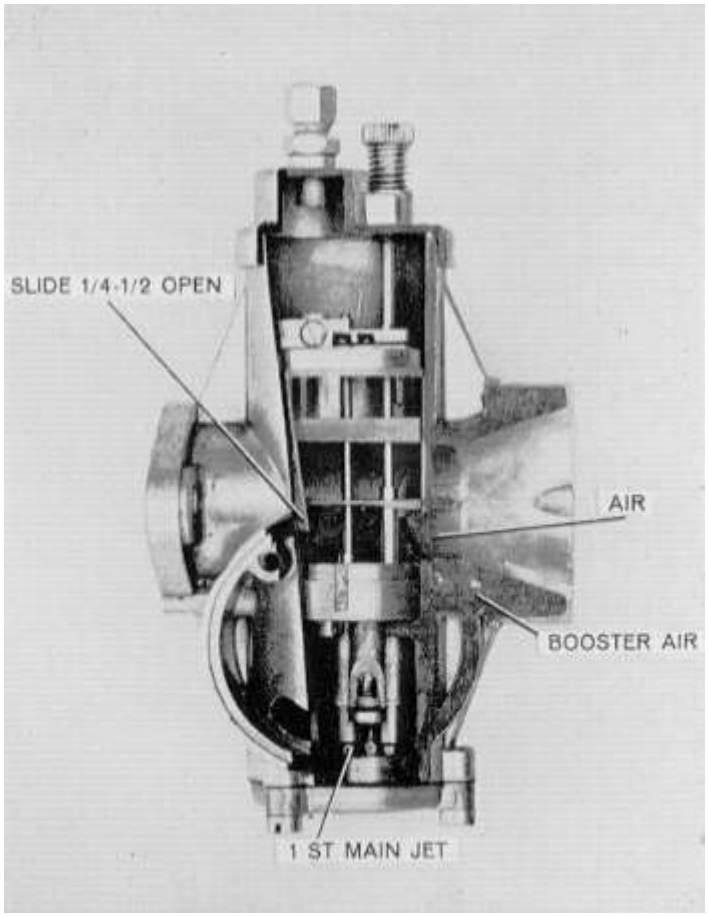


3. The higher the cutaway (stamped in millimeters atop the slide), the smaller the amount of fuel flow (leaner mixture]. The smaller the cutaway, the greater the fuel flow (richer mixture).

4 The amount of fuel that flows from 1/8-1/4 throttle is also regulated by the tapered needle and the needle jet. As the slide is raised, the 1st needle is also raised. As the needle is raised, it permits more and more fuel to flow up through the main jet, the needle jet, and the spray nozzle.

5. The needle is suspended from the slide by means of a clip fitted to one of three grooves in the slide. If the mixture is too lean from 1/8 to 1/4 throttle, you can make it richer by raising the needle in the slide. To do this, fit the clip to a lower groove in the needle. To lean the mixture, lower the needle by fitting the clip to a higher groove in the needle.

6 You can also vary the mixture by fitting another slide with a different cutaway, but this will affect the mixture from 1/2 to 3/4 throttle. You can also fit a different needle jet, or a needle of different diameter, to vary the mixture. However, it is best to vary the mixture by raising or lowering the needle.



Section 4. 1/4-1/2 Throttle: Slide and 1st-Main-Jet Metering System.

1. From 1/4 to 1/2 throttle, the flow of air is regulated by the position of the slide. As the slide nears the divider in the middle of the bore, the cutaway has less and less effect. A higher vacuum is created at the spray nozzle, drawing out more fuel yet.

2. As the needle is raised higher in the needle jet, it becomes less effective in metering the flow of fuel accurately. Toward the halfway mark, the 1st-main-jet controls the flow of fuel up to the spray nozzle.

3. As the slide nears the middle of the bore, a slight upward movement of the slide will increase considerably the volume of air that can flow through the bore of the carburetor. This requires a greatly-increased flow of fuel, which is not provided for by the slight increase in vacuum at the mouth of the spray nozzle. To compensate for this, the carburetor is provided with a booster system.

4. To boost the flow of fuel, air enters the right-hand small hole beneath the mouth of the carburetor. This air is fed into several small holes drilled halfway up the needle jet. This passage of air up the needle jet increases the flow of fuel up the needle jet to the spray nozzle.

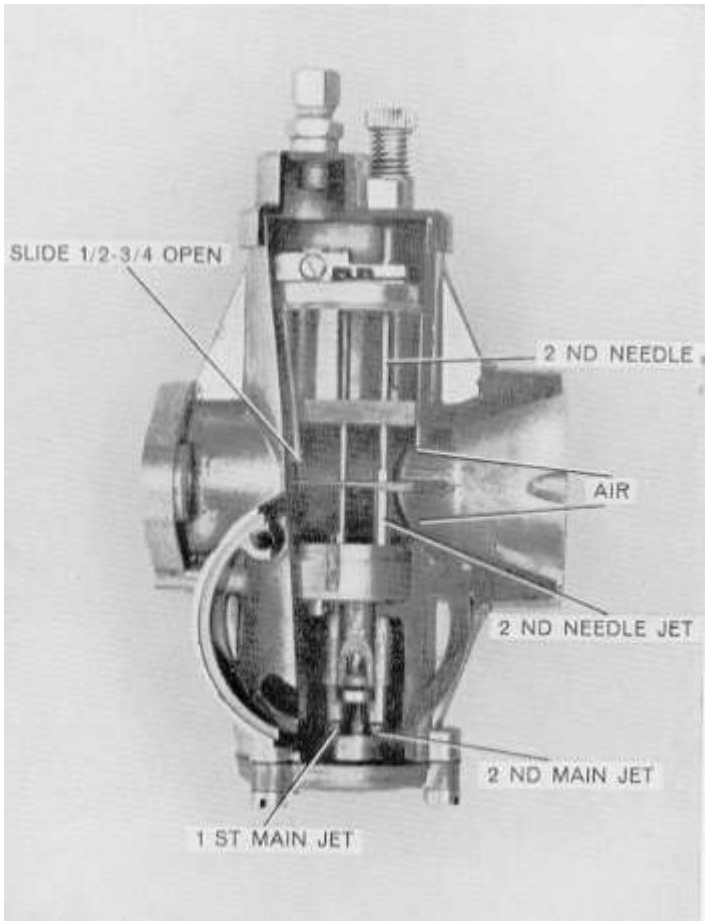
5. To richen the mixture from 1/4-1/2 throttle, you could fit a 1st-needle-jet with larger holes (the larger number stamped in the jet gives the size of the air holes), but it is simpler to fit a larger 1st-main-jet.

6. The proportion of the mixture at 1/2 throttle also affects the mixture at wider throttle openings.

Section 5. 1/2-3/4 Throttle: Slide Cutaway and 2nd Needle Metering System.

1. From 1/2 to 3/4 throttle, the additional flow of air is regulated by the slide cutaway, which also affects the flow of fuel. The flow of fuel from the 1st-main-jet is constant. The additional flow of fuel is regulated by the needle and the needle jet.

2. You can vary the mixture from 1/2 to 3/4 throttle by using a slide with a different cutaway, but this will also affect the mixture from 1/8 to 1/4 throttle.

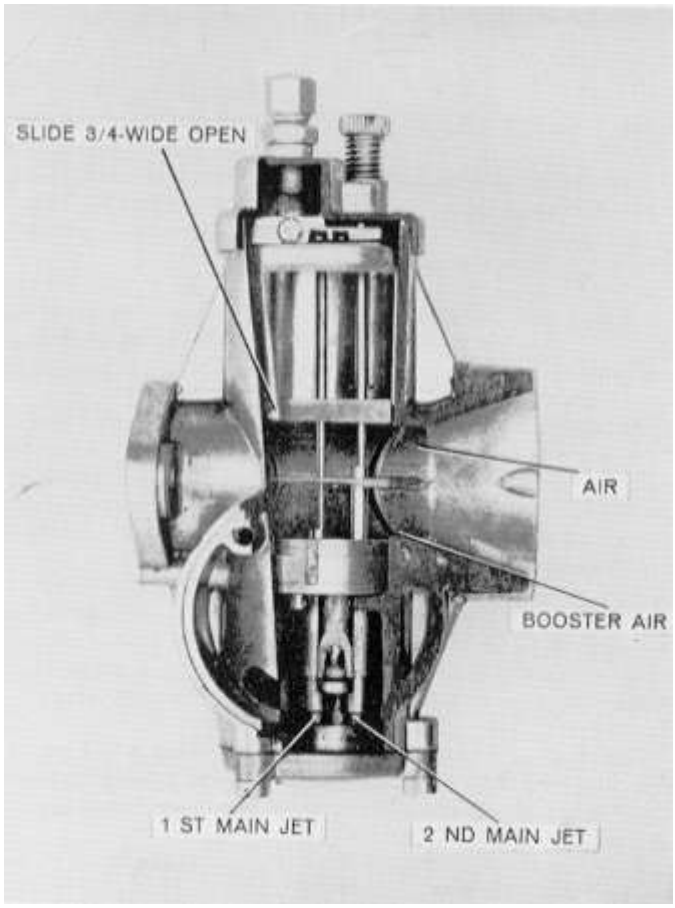


3. You can vary the mixture by changing the 2nd-needle-jet and the diameter of the 2nd needle.

4. However, it is best to vary the mixture from 1/2 to 3/4 throttle by raising the 2nd needle in the slide to richen the mixture, or by lowering the 2nd needle in the slide to lean the mixture.

Section 6. 3/4 Full Throttle: Slide and 2nd Main Jet Metering System.

1. From 3/4 to full throttle, the additional flow of air is regulated by the position of the slide. As the slide nears the top of the bore, the



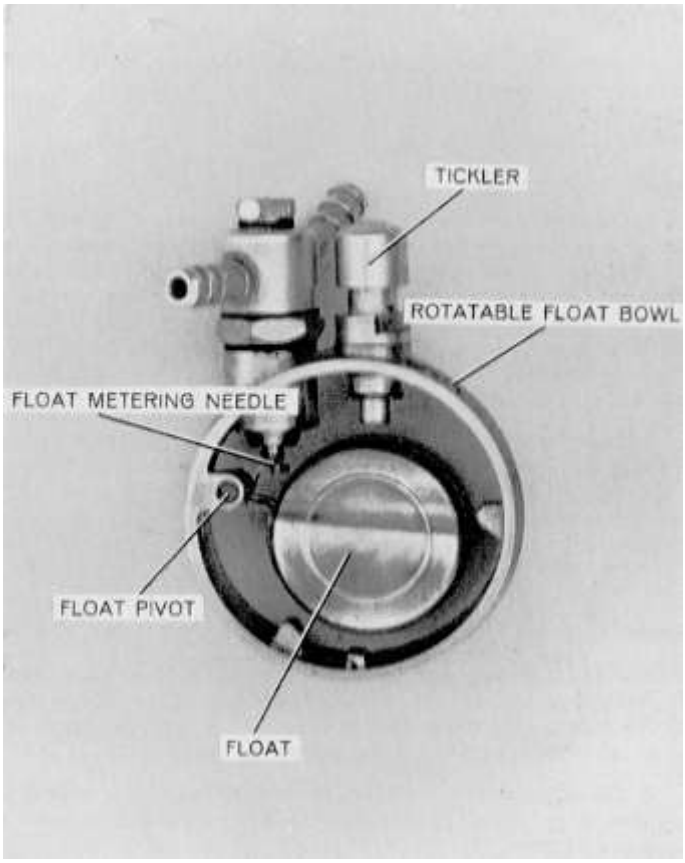
cutaway has less effect. A higher vacuum is created at the spray nozzle, drawing out more and more fuel.

2. As the needle is raised higher in the needle jet, it becomes less effective in metering the flow of fuel accurately. Toward the top of the bore, the 2nd-main-jet controls the flow of fuel up to the spray nozzle.

3. The 2nd-needle-jet is also fitted with a booster system. Air enters the middle small hole beneath the mouth of the carburetor and travels through a passage to holes drilled in the 2nd needle jet, to increase the rate of fuel flow.

4. To vary the mixture from 3/4 to full throttle, it is best to fit a larger 2nd-main-jet to richen the mixture, or a smaller 2nd-main-jet to lean the mixture.

5. NOTE: each metering system blends gradually with the one preceding it and the one following it. This is particularly true when shifting from the cutaway and the needle to the slide and the main jet. The objective of regulating the carburetor is to arrive at a condition wherein there is a smooth shift from one metering system to the next, and the proportion of fuel and air remains the same from closed throttle to full throttle.



Section 7. The Float Metering Device.

1. The float bowl provides a constant level of fuel for the fuel metering systems. This constant fuel pressure maintains a constant rate of flow through the jets.

2. When the fuel flows through the metering jet in the top of the float bowl, the fuel level in the float bowl rises, and the float rises. As the float rises, its bracket presses upward on the metering needle. When the fuel level reaches a predetermined point, the float bracket seats the metering needle in the metering jet, which stops the flow of fuel into the float bowl.

3. The IRZ Model DG carburetor has a rotatable float bowl. If the carburetor is not mounted to the engine in a vertical position, the two float-bowl mounting bolts can be loosened, and the float bowl can be rotated to a vertical position. This decreases the possibility of a sticking float needle that can result when the float bowl is not mounted vertically.

Chapter 2. ADJUSTMENT

Chapter 2 tells how to adjust the carburetion. It consists of the following:

Section 1. Rough Tuning.

Section 2. Fine Tuning.

2. Carburetion is affected by the heat range of the spark plug that you are using. A spark plug that is too cold can give the same symptoms as a mixture that is too rich, with the same results (four stroking, plug oiling, etc.). A spark plug that is too hot can give the same symptoms as a lean mixture (overheating, whiskerings, detonation, etc.). Check the OSSA Owner's Manual to make certain that the machine is fitted with a suitable spark plug. A lean mixture can also be caused by an air leak at the carburetor gasket.

3. Because the main jets in this carburetor are so small, a tiny particle of dirt in the wrong place can cause a lean mixture at several (but not necessarily all) throttle openings. If the carburetor gives a "lean" indication, clean the fuel banjo and the jets and spray nozzles before attempting to regulate the carburetor. Whenever you disassemble this carburetor, take particular pains to keep it clean.

Section 1. Rough Tuning.

1. Run the motorcycle until the engine is warm. On level ground, with the machine in 2nd gear, run the engine up to peak rpm. Slowly back off the throttle until the throttle is closed. While you are backing off the throttle, listen carefully to the engine and the exhaust.

2. If the engine makes a pinging, or rattling, sound, the mixture is too lean. If you hear this noise, remember at what throttle opening the noise occurred.

3. If the exhaust sounds like that of a four stroke engine, in which the engine is firing every other revolution, the mixture is too rich. If you hear this sound, remember at what throttle opening the noise occurred.

4. Between full and 3/4 throttle, if the engine was pinging, fit a larger 2nd-main-jet. If the engine was four stroking, fit a smaller 2nd-main-jet. Road test the machine again, to make certain that the problem has been solved.

5. Between 1/2 and 3/4 throttle, if the engine was pinging, raise the 2nd needle one notch in the slide. If the engine was four stroking, lower the 2nd needle one notch in the slide. Test the machine again.

6. Between 1/4 and 1/2 throttle, if the engine was pinging, fit a larger 1st-main-jet. If the engine was four stroking, fit a smaller 1st-main-jet. Test the machine again, and make certain that you have not adversely affected the higher throttle openings. If you have, install the original 1st-main-jet and raise or lower the 1st needle in the slide. Test the machine again.

7. Between 1/8 and 1/4 throttle, if the engine was pinging, raise the 1st needle one notch in the slide. If the engine was four stroking, lower the 1st needle one notch in the slide. Test the machine again.

8. Between 0 and 1/8 throttle, if the engine was pinging, rotate the low speed mixture-screw counterclockwise. If the engine was four stroking, rotate the Iow-speed mixture control clockwise. Test the machine again.

9. This test will indicate whether or not the carburetion is adjusted well enough so that the engine will not overheat badly or oil sparkplugs.

Section 2. Fine Tuning.

1. To learn whether or not the carburetion is exactly right, you will need to take a series of spark plug readings, at slightly less than 1/8, 1/4, 1/2, 3/4, and full throttle.

2. To take a spark plug reading, ride the machine for at least 1/4 mile with the throttle at the opening that you wish to test. Then push the kill button, and at the same instant, pull the clutch. Hold in the kill button until you are certain that the engine has stopped. Hold in the clutch and coast to a stop.

3. Remove the spark plug and check its condition. It should be dry, and it should be malt brown in color at the end of the porcelain insulator that surrounds the center electrode. If this porcelain insulator is white, the mixture at that throttle opening is too lean. If the insulator is black and oily, the mixture is too rich.

4. Adjust the carburetion as recommended at Section 1. If the mixture is too lean or too rich both at full throttle and at 1/2 throttle, change the 1st-main-jet and check its effect upon the 3/4 and full throttle readings. You may need to change both main jets and change the position of the 2nd needle.

5. If the mixture is too rich or too lean at 3/4 and 1/4 throttle, you may wish to lean the mixture by fitting a slide with a larger cutaway, or richen the mixture by fitting a slide with a smaller cutaway.

6. If the mixture is too lean or too rich at 3/4 throttle or at 1/4 throttle (but not both), and changing the position of the needle creates too much of a change in the carburetion, you may wish to substitute a larger or smaller needle jet.

PART B

Chapter 1. DISASSEMBLY

Chapter 1 consists of the following:

Section 1. Removing the Engine.
Section 2. Removing the Piston.
Section 3. Stripping the Magneto Side Engine Case.
Section 4. Stripping the Primary Side Engine Case.
Section 5. Splitting the Engine Cases.
Section 6. Removing the Gearbox Components.
Section 7. Removing the Countershaft Assembly.

2. Before attempting to remove the engine from the frame, clean the motorcycle thoroughly, so that dirt will not get into the carburetor or other critical assemblies. It is easier (and faster) to work on a clean motorcycle than a dirty one.

3. Locate or grind large screwdrivers so that their bits will fit the Ossa engine screws exactly. Otherwise, you'll chew up the screw heads, and the job will look amateurish.

4. The instructions gives in Section 1 of this chapter do not apply in every case to every model. For example, you do not need to remove the saddle of the Wildfire in order to remove the gas tank and the engine. The remainder of Part B does apply to all 1967 230 cc Ossa models sold in the United States.

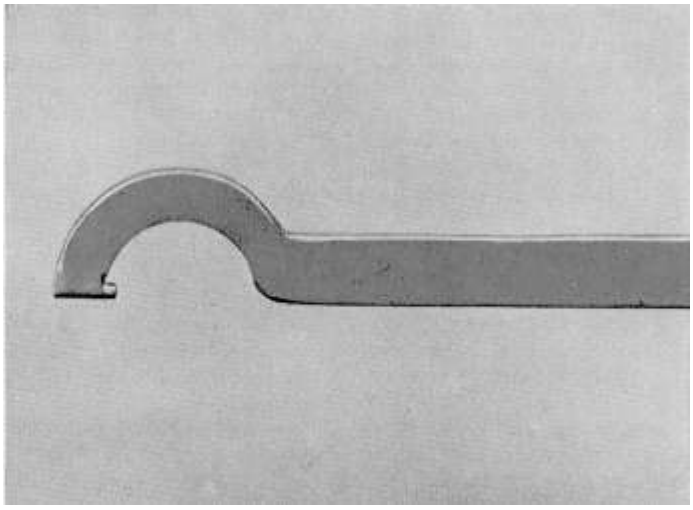
5. The photos in Part B show a motorcycle with foot peg and rear brake pedal removed; you do not need to remove these parts in order to remove the engine from the motorcycle.

6. The photos in Part B do not show the use of torque wrenches. You should use a torque wrench whenever torque readings are specified in the text. To do this, you will need two torque wrenches: one reading 0-15 ft/lbs; and one reading 1-100 ft/lbs.

Section 1. Removing the Engine.

1. With a screwdriver, loosen the slotted bolt that clamps the air cleaner to the mouth of the carburetor. Remove the air cleaner.

2. Loosen the two nuts and bolts (with 10 mm wrenches), or the nut (14 mm) that mount the muffler to the motorcycle frame.



3. With the OSSA exhaust spanner, rotate the threaded exhaust pipe collar counterclockwise to remove it from the cylinder.

4. Remove the muffler mount bolts (or nut) that you loosened in Step 2 above. Remove the exhaust system (pipe and muffler) from the motorcycle.

5. OFF-ROAD MODELS. With two 10 mm sockets, remove the six rear fender nuts and bolts. If the machine has a taillight, remove the taillight lens. With a small screwdriver, loosen the screw clamping the wire that goes out through the rear of the taillight assembly. Remove the wire from the rear fender. Remove the rear fender.

6. OFF-ROAD MODELS. With 10 mm wrenches, remove the four 10 mm bolts and the two nuts from the saddle mount portion of the gas tank assembly.

7. WILDFIRE. With a spring hook, remove the spring hanger from the rear of the gas tank.

8. Remove the gas tank from the motorcycle.

9. On the right side of the motorcycle, use a screwdriver to remove the two screws with nylon washers from the plastic side panel. With two 10 mm wrenches, remove the nut and bolt from the side panel in the same manner, remove the two screws and the nut and bolt from the plastic side panel on the left side of the motorcycle. Remove the panels from the motorcycle.

10. Pioneer. In the electrical junction block near the top of the rear down tube, loosen the terminal screw that mounts the wiring to the taillight assembly. Remove the wire and remove the rear fender from the motorcycle.

11. With a screwdriver, remove the two screws that mount the top of the carburetor to the body of the carburetor. Remove the top and the slide from the body of the carburetor.

12. With an 11 mm wrench, loosen the two nuts that mount the carburetor to the intake manifold. Pull the carburetor away from the manifold, and remove the two nuts. Remove the carburetor from the engine.

13. With the Ossa magneto flywheel holding tool, rotate the clutch arm clockwise (CW), in the same manner as if you had pulled the handlebar clutch lever. Remove the lower end of the clutch cable from the clutch arm.

14. With a screwdriver that fits, remove the four screws that mount the magneto case to the engine cases. Remove the magneto case from the engine. Be careful not to lose the clutch cam plunger from the magneto case.

15. Rotate the rear wheel until the master link is visible. Remove the master link. Rotate the rear wheel and remove the rear chain from the motorcycle.

16. With a sharp knife, cut the tape that mounts the electrical wiring to the rear down tube. Remove the wiring from the clamps on the rear down tube.

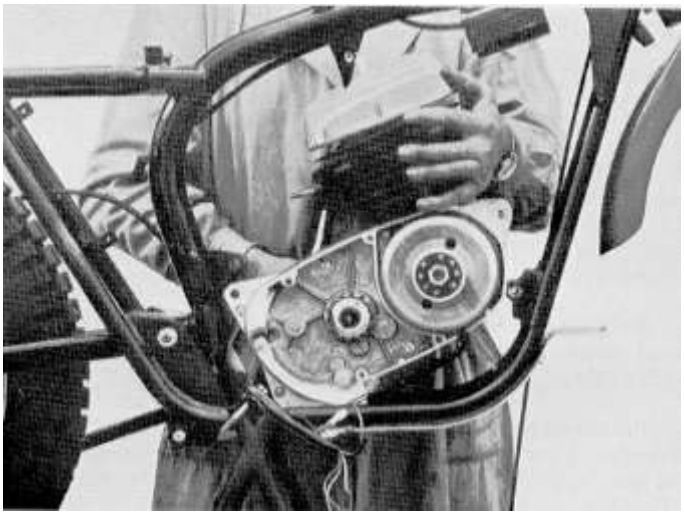
17. With a small screwdriver, loosen all of the terminal screws on the side of the electrical junction block that goes to the engine. Remove all of the wires from that side of the junction block.

18. Pull free from the HV coil the two clips that connect the wires from the engine to the HV coil. Allow the engine wiring to dangle from the bottom of the engine. With a 10 mm wrench, remove the two bolts that mount the HV coil to the frame. Remove the HV coil.

19. With two 14 mm wrenches, remove the nut from the top rear engine mount bolt. In the same manner, remove the nut from the bottom rear engine mount bolt.

20. With two 14 mm wrenches, remove the nut from the right front engine mount bolt. In the same manner, remove the nut from the left front engine mount bolt. With a brass drift and a mallet, tap out the two rear engine mount bolts. Remove the two engine mount bolts; lift up the front of the engine so that the bolts will come out easily.

21. Lift up the front of the engine, so that the front mounting lugs are above the front mounting brackets. Drop the rear of the engine, so that the rear mounting lugs are beneath their mounting brackets. Pull the engine straight out to either side of the motorcycle and remove the engine from the frame. If you put the engine on the floor, be careful not to put the engine on the electrical wiring harness.

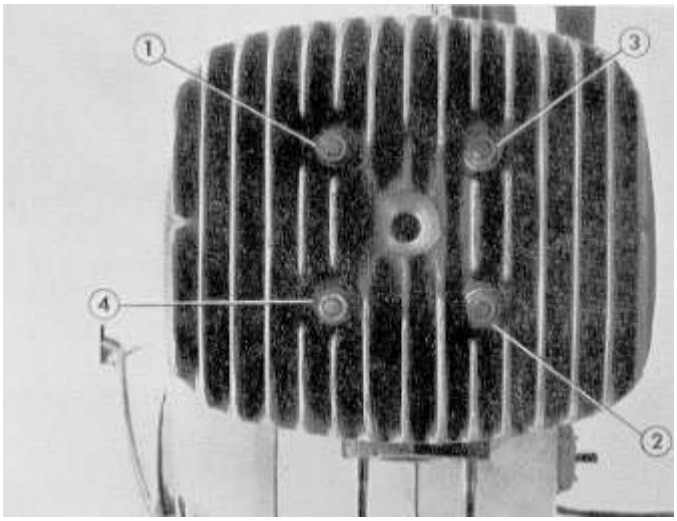


Section 2. Removing the Piston.

1. Clean the engine carefully and put it in the engine stand.

2. Remove the spark plug.

3. From the top of the cylinder head, viewing the front of the cylinder head as being 12:00 o'clock on the face of a dock, loosen the four cylinder head nuts 1/4 turn each, in the following sequence: 10 o'clock; 4 o'clock; 2 o'clock; 8 o'clock. Using the same sequence, loosen the the cylinder head nuts another 1/4 turn each.



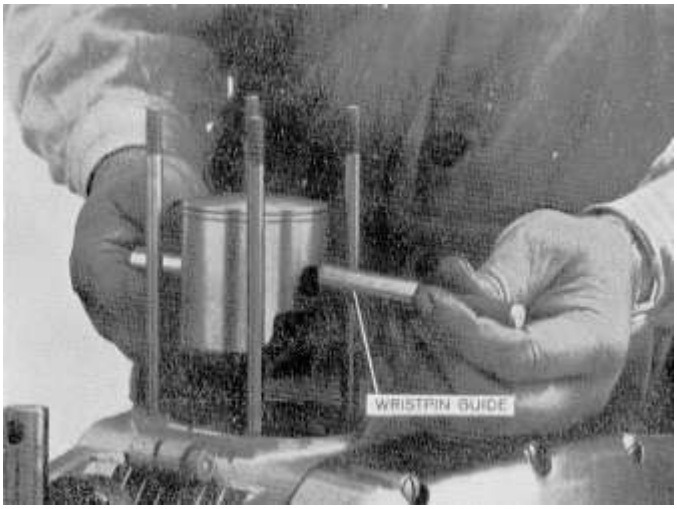
NOTE: if you do not follow this procedure, you run the risk of warping the cylinder head. Now remove the cylinder head nuts.

4. Remove the cylinder head and its gasket.

5. Remove the cylinder, slowly enough so as not to break the cylinder base gasket being careful to catch the piston so that it cannot fall against the engine cases or one of the studs.

6. Wrap a shop rag around the con rod to prevent the wristpin clips from falling down into the engine cases. With a pair of thin nose pliers, remove the two wristpin-clips from the piston. Do not bend the clip; if you do so, discard it.

7. Butt the Ossa wrist pin guide against one end of the wrist pin. Hold the the piston with one hand, to prevent any side loading of the con rod. With the the palm of the other hand, press against the wrist pin guide to push the wrist pin out of the piston. If the wrist pin is tight and will not move, remove the guide and fit a wrist pin driver to the piston and press out the wrist pin. Do not attempt to drive out the wrist pin by hitting the guide with a mallet. Under operating conditions, the con rod does not receive any side loads, so it is not designed to withstand side loads, and even gentle tapping against the wrist pin guide with a mallet can bend the con rod.

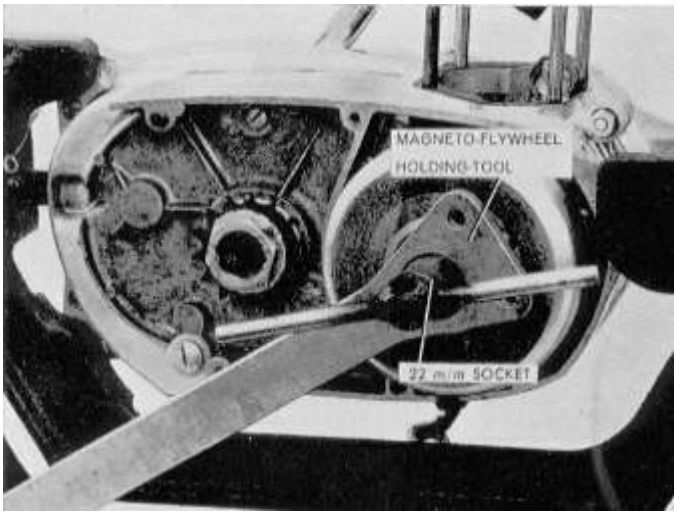


8. Remove the wrist pin guide (or the driver) from the piston. Remove the piston from the con rod. Remove the needle bearing from the wrist pin guide (or the con rod).

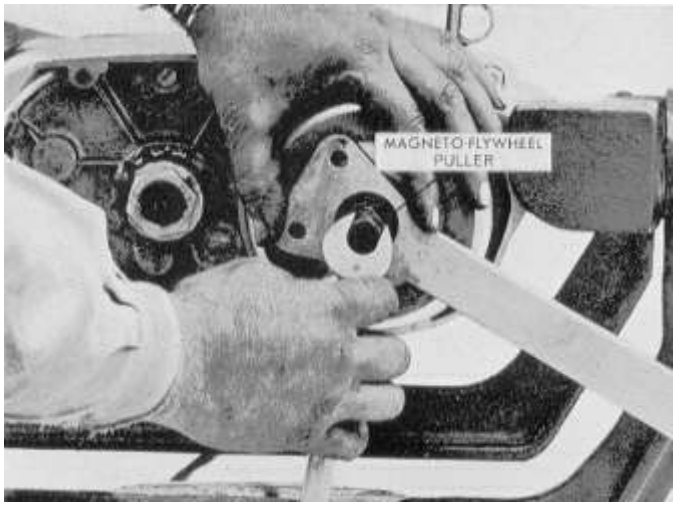
9. Remove the cylinder base gasket.

Section 3. Stripping the Magneto Side Engine Case

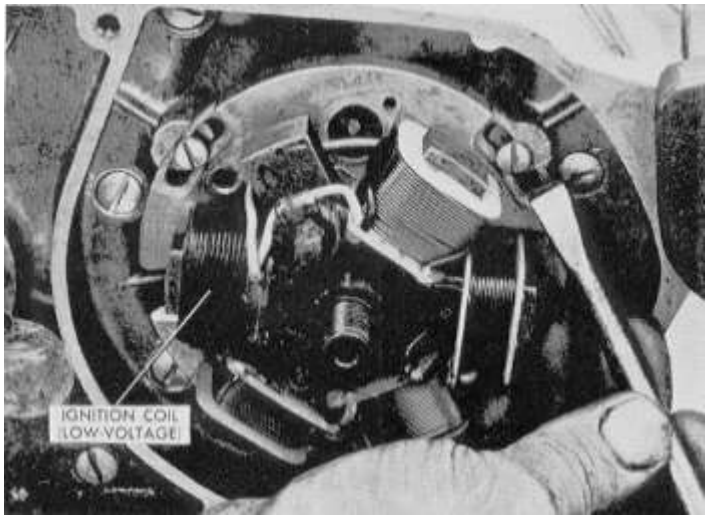
1. Fit the OSSA magneto flywheel holding tool to the two holes in the magneto flywheel. With a 22 mm socket, remove the magneto flywheel nut.



2. Back out the center bolt of the OSSA magneto flywheel puller. Screw the puller into the magneto flywheel (with the holding tool still in position). With a 19 mm wrench, tighten the puller in the flywheel. With a 17 mm wrench, tighten the center bolt of the puller until the magneto flywheel is freed from its press fit on the crankshaft. Remove the magneto flywheel. Remove the washer from the flywheel.



3. With a chisel and a mallet, scribe a line across the edge of the magneto backing plate and one ofits mounting bosses, as a reference when reassembling the engine.



4. With a screwdriver, remove the three screws that mount the backing plate to the engine case. Remove the backing plate, and fit it to the magneto flywheel, to prevent damage to either.

5. With a screwdriver and a mallet, remove the Woodruff key from the magneto side crankshaft. Put the key on the side of the magneto flywheel.

Section 4. Stripping the Primary Side Engine Case.

1. With a 10 mm wrench, loosen the bolt that mounts the foot shift lever to its shaft. Remove the bolt from the lever, and remove the foot shift lever.

2. With an 11 mm wrench, loosen the bolt that mounts the kick starter lever to its shaft. Remove the bolt from the lever. Remove the kick starter lever.

3. Position a pan beneath the drain plug on the bottom of the engine. With a 19 mm socket, remove the drain plug. If you tip the engine forward, most of the lubricant will be drained from the gearbox and the primary case.

4. With a screwdriver, unscrew the ten screws that mount the primary case to the engine case. Leave the screws in the case.

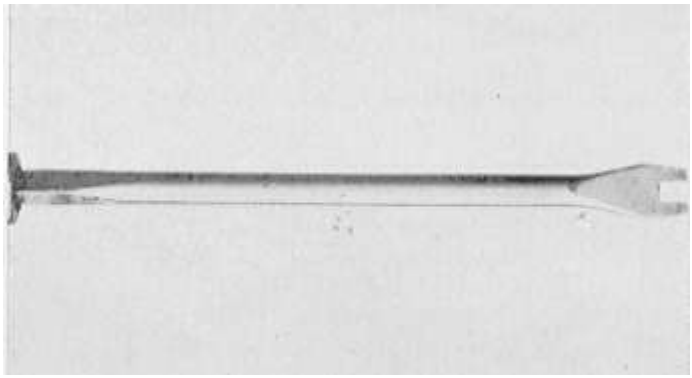
5. With a screwdriver, remove one of the screws that mount the inspection cover. Loosen the other mounting screw, and swing aside the inspection cover. Insert a large screwdriver, and lever it against the outer clutch plate, to loosen the primary case. If necessary, tap upward on the right edge of the primary case with the rubber mallet to free the primary case. Hold the selector shaft in position inside the engine cases while you remove the primary case.

6. Remove the primary case from the engine. Remove the primary case gasket. Be careful not to lose the two locating dowels from the primary case.

7. Remove the spring washer and the fIat washer from the selector shaft (foot-shift-lever shaft).

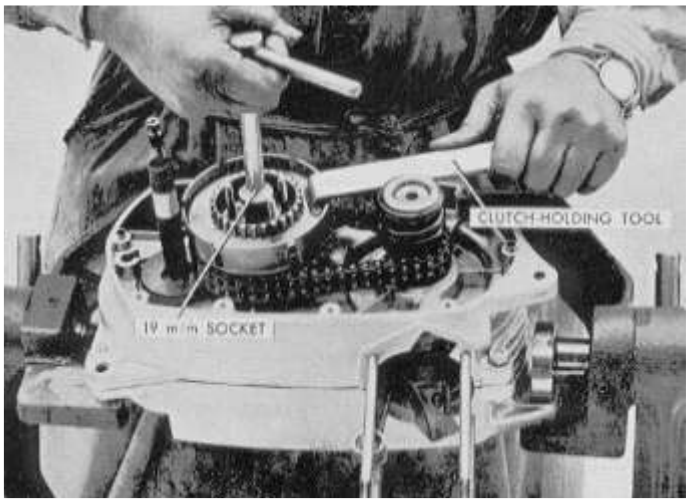
8. With needle nose pliers, straighten and remove the five cotter pins from their studs at the outer clutch plate.

9. With the spanner screwdriver, remove the five clutch spring nuts. Remove the springs and the spring cups.



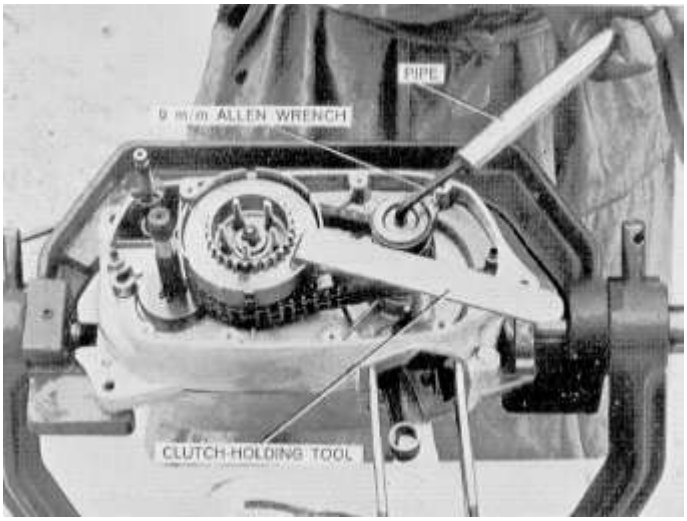
10. Pull out all of the clutch plates except for the inner plate. Loosen the inner plate with two thin screwdrivers, and remove it.

11. Fit the OSSA clutch holding tool to the clutch hubs, and rotate the clutch counterclockwise (CCW) until the handle of the tool rests against the cush-drive assembly. With a 19 mm socket, loosen the clutch nut.



12. With the clutch tool still in position, fit the OSSA 9 mm Allen wrench to the cush-drive Allen nut. Fit a pipe to the Allen wrench to serve as a cheater (for more leverage). Loosen the Allen nut.

13. Remove the clutch nut.

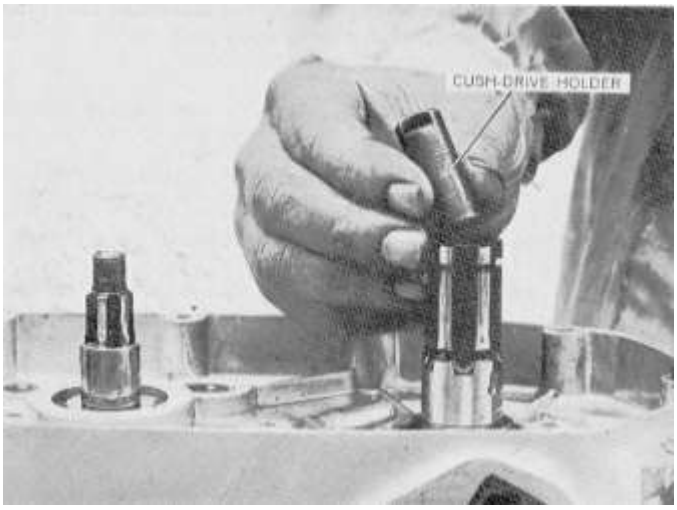


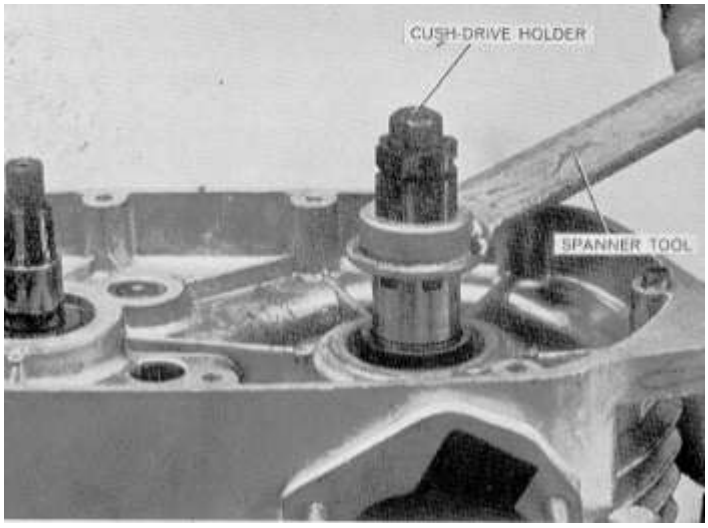
14. Remove the coupling.

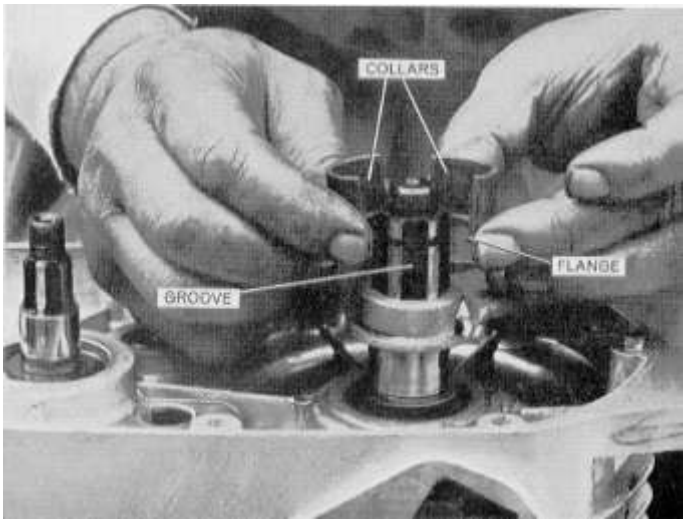
15. Remove the the main shaft cush-drive Allen nut, the flange, the spring, and the inner clutch hub. Remove the inner hub spacer from the main shaft.

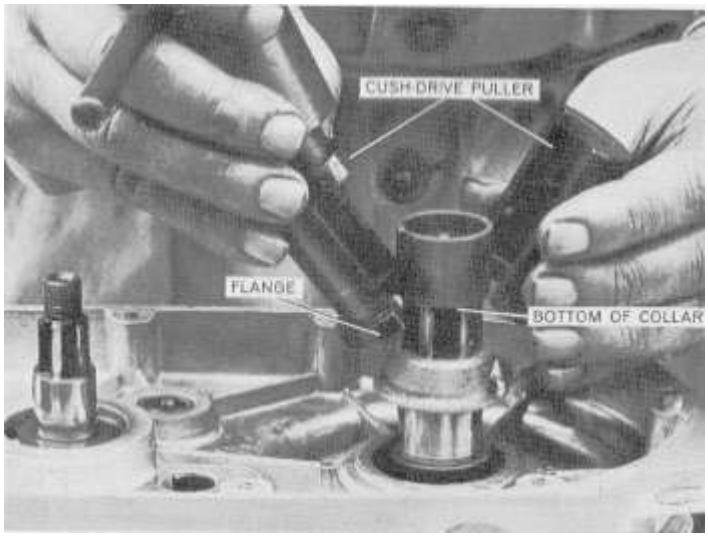
16. Remove the outer clutch hub, the engine sprocket, and the primary chain as a unit. Remove the bushing and the spacer from the main shaft.

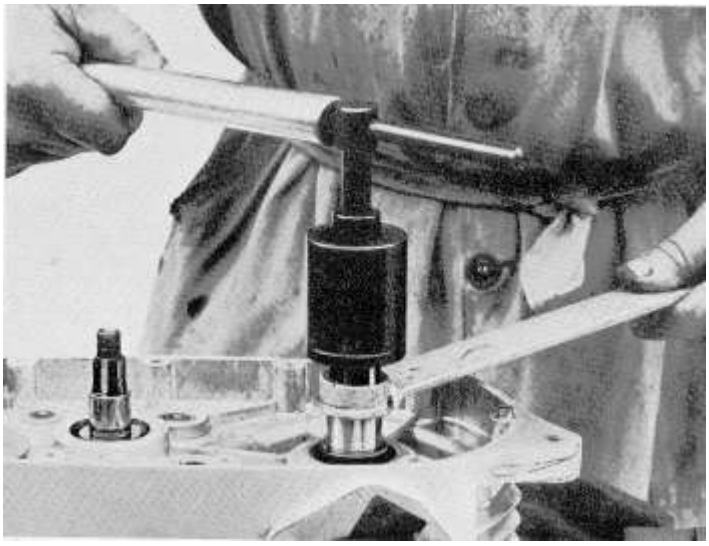
17. The cush-drive shaft is a press fit on the primary side crankshaft. You will need to use several OSSA tools to remove the cush-drive shaft. First, screw the cush-drive holder into the crankshaft threads. Then f it the spanner tool to the cush-drive shaft. Fit the two collars to the end of the cush-drive holder. Back out the center bolt in the cush-drive puller.- Mount the puller to the collars on the holder. Hold the spanner and tighten the center bolt of the puller to free the cush-drive shaft from the crankshaft. Remove the cush-drive shaft from the crankshaft.




CUSH-DRIVE HOLDER
SPANNER TOOL


COLLARS
FLANGE
GROOVE


CUSH-DRIVE PULLER
FLANGE
BOTTOM OF COLLAR



18. With snap ring pliers, remove the snap ring from the kick starter shaft. Remove the large washer beneath the snap ring.

19. With a large screwdriver, free the looped end of the kickstarter return spring from its mount in the engine case. Be careful not to let it fly off the shaft and hit you in the face or hand. With a spring hook or needle nose pliers, free the other end of the spring from the kick starter shaft.

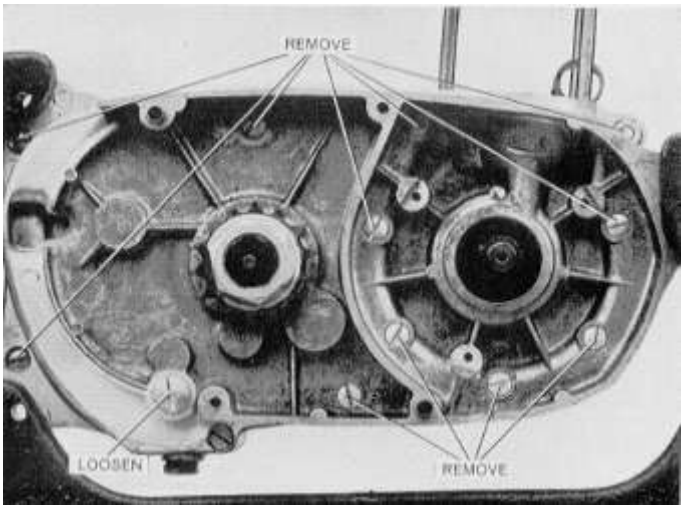
20. Remove the kickstarter-return spring and the large washer from the kick starter shaft.

Section 5. Splitting the Engine Cases.

1. On the right side of the engine, loosen the 11 engine case screws 1/4-tum each. Then remove the screws, working from the middle of the engine toward the ends.

2. With two 14 mm wrenches, remove the engine case nut and bolt at the front of the engine. Be careful not to let the engine cases fall apart.

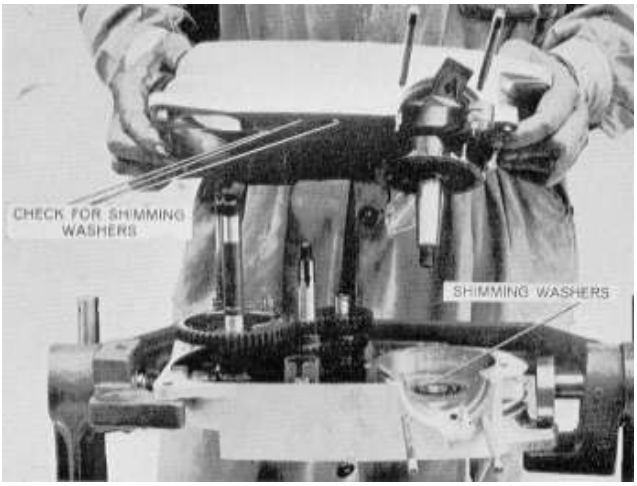
3. With a screwdriver, loosen the large screw with the nylon washer (the shifter drum detent) at the bottom rear of the engine.



4 With the primary side engine-case facing upward, tap upward on the primary side engine case to free it from the magneto side engine case. Lift off the primary side case, which will retain the crankshaft assembly. On the primary side engine case, check the mounting bosses for the main shaft, the lay shaft, the shifter drum, and the selector shaft. Look for shimming washers that might have stuck to the bosses in the case. If any washers have stuck to the boses, remove the washers and put them on their shaft in the other case.

5. NOTE: The amount of play in each shaft in the gearbox is critical. The factory adjusts each gearbox separately, adding as many shimming washers to the top, and as many shimming washers to the bottom, of each shaft as is necessary. The shimming washers come in different thickness. It is very important not to get the shimming washers mixed up as you disassemble the gearbox.

6. Lift the shimming washers from atop the main bearing in the magneto side engine case, and tag them.



Section 6. Removing the Gearbox Components.

1. If you do not need to repair gearbox components, do not remove them; proceed to Chapter 2. To remove gearbox components, remove the engine-case gasket and throw it away.

2. Rotate the kick starter shaft clockwise until the cam on the engaging ratchet is free of the gears and the large screw in the case.
Lift out the kick starter shaft, with al! ofits washers, and put it aside.

3. Pull out the selector shaft, with its washers, and put it aside.

4. Pull up the shifter fork shaft until you can disengage the forks from the cam grooves in the shifter drum. Lift out the shifter drum, with its washers.

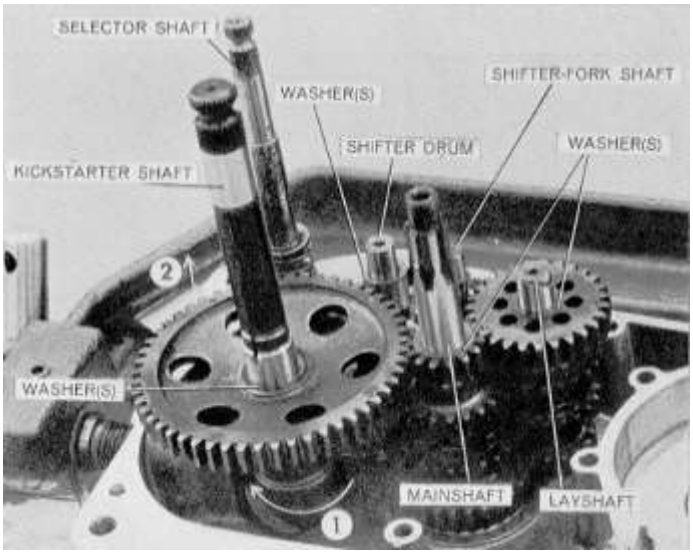
5. Remove the large screw with the nylon washer from the outside of the engine case; this is the detent plunger.

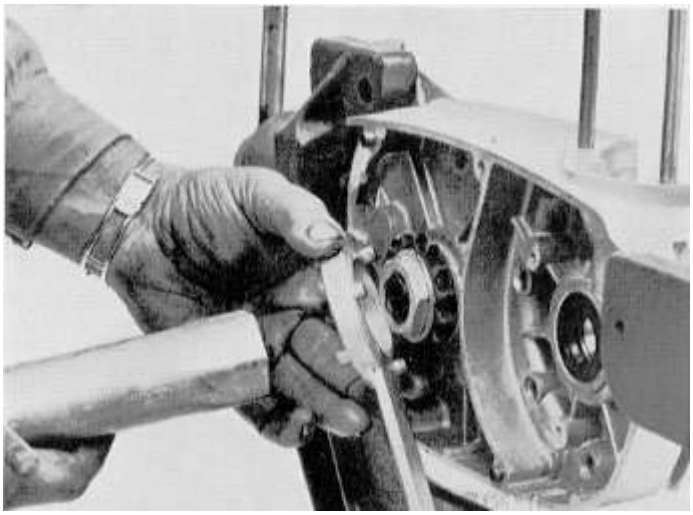
6. Lift out the shifter forks on their shaft.

7. Lift out the layshaft, with its various washers.

8. Lift the main shaft, with its brass bushing and washers, out of the countershaft. Remove the clutch push rods and the ball bearing.

9. Lift off the slotted plastic breather tube.





Section 7. Removing the Countershaft Assembly

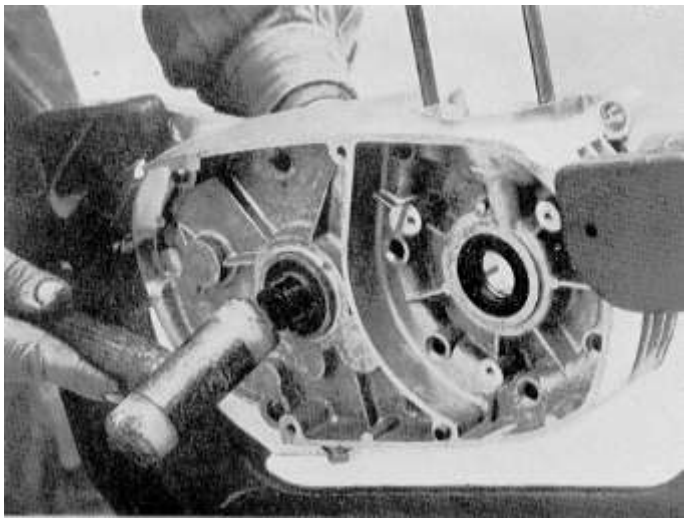
1. From the inside of the engine case, lift the two needle bearings out of the countershaft.

2. With a mallet and a chisel, flatten the countershaft nut washer on the outside of the engine case.

3. Fit the OSSA countershaft sprocket spanner to the countershaft sprocket. Fit the OSSA countershaft nut tool to the countershaft nut. Rotate the tool clockwise (CW) to loosen and remove the countershaft nut.

4. Remove the countershaft washer and the countershaft sprocket. From the outside of the engine case, tap the countershaft with a mallet to remove it.

5. To remove the oil seal from the countershaft, pry it loose with a screwdriver.



Chapter 2. REPAIRING THE CRANKSHAFT ASSEMBLY

Chapter 2 consists at the following:

Section 1. Removing the Crankshaft Assembly.

Section 2. Repairing the Crankshaft Assembly.

Section 3. Installing the Crankshaft Assembly.

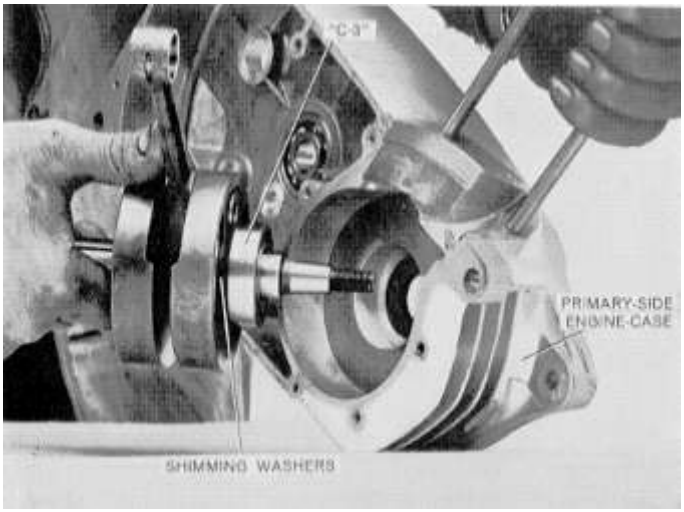
Section 1. Removing the Crankshaft Assembly.

1. Heat the primary side engine case, from the flywheel side, for about ten minutes, with a small electric stove. If you use a torch, keep it moving around the crankshaft boss, and just heat it for about 45 seconds. Do not heat the case from the other side, or you may damage the seal.

2. Wrap a cloth around the magneto side drive shaft and pull the crankshaft assembly out of the engine case. The primary side main bearing will remain on the drive shaft.

3. To remove the primary side main bearing, clamp the other drive shaft in vise fitted with soft lead jaws, and pry loose the bearing with two screwdrivers. Note that this bearing has the inscription "C-3" on its face; the magneto side main bearing is not marked.

4. If any shimming washers were fitted between the primary side main bearing and the flywheel, save and tag these washers.



5. To remove either of the crankshaft seals, simply pry them out with a screwdriver

Section 2. Repairing the Crankshaft Assembly

1. If you need to repair a crankshaft assembly, we recommend strongly that you send it to your OSSA distributor and have the work done there.

2 Most dealers have (or have access to) a 15 ton press. However, for pressing apart the flywheels, a special jig is needed to prevent damage to the con rod.

3. For pressing the flywheels together, a special jig with spring loaded guides is needed to center the two flywheels and the crank pin. If these components are not perfectly aligned before the are pressed together, the crank pin holes in the flywheels will become enlarged, which ruins the flywheels.

4. If one of the crank halves needs to be replaced, and if the remaining crank half has balance holes drilled in its narrow face (some do; some don't), these holes will have to be matched in the new crank half. Special drills are needed for this work, because the flywheels have been surface hardened.

5. It is impossible to align the flywheels with a hammer, after reassemble.

6. For the above reasons, we recommend that you send any damaged crankshaft assemblies to your OSSA distributor for repair. He has a duplicate set of factory assembly line tools for rebuilding and aligning the crankshaft assembly.

Section 3. Installing the Crankshaft Assembly.

1. To install a new crankshaft seal, warm the engine case around the crankshaft boss. Insert the OSSA seal guide from the inside of the engine case. Fit a new crankshaft sea! to the seal guide. Fit the OSSA seal driver to the seal. With a mallet, rap the seal driver until the seal is positioned in the case.

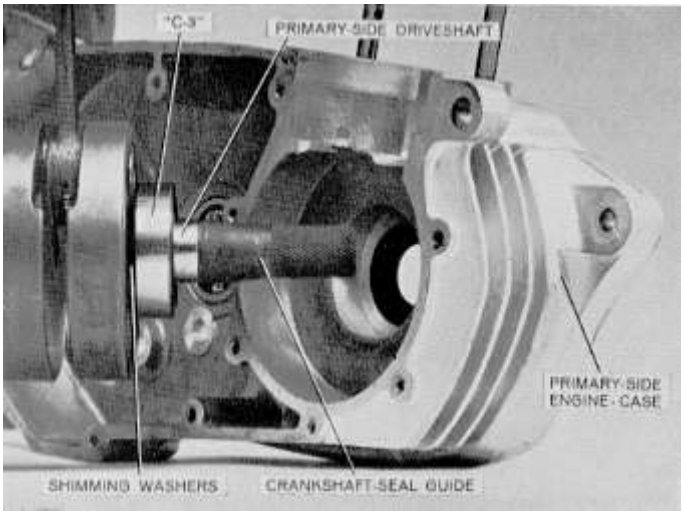
2. To mount a new magneto side main bearing in the magneto side engine case, warm the around the crankshaft boss from the inside of the case, to prevent damage to the seal. Turn the case over, and tap it gently against the bench. The old main bearing will fall out. Drop a new main bearing (which has no marking on its narrow face) into the bearing mount in the hot engine case.

3. To mount a new primary-side main bearing on the primary-side drive shaft of the crankshaft assembly, fit the shimming washers to the drive shaft. Then drive the new main bearing (marked C-3 on its narrow face) into position against the flywheel! with the OSSA bearing driver. If you do not have a bearing driver, tap the inner race of the bearing with a mallet and a drift to drive it into position.

4. NOTE: take special precautions not to place mag-side shimming washers on the primary-side of the crankshaft assembly, and vice versa. The con rod has a great deal of side play on the crank pin, so that it will be certain to receive enough lubrication; the factory then determines the number and thicknesses of shimming washers between the main bearings and the flywheels to position the crankshaft assembly so that the con rod will not place a side-load on the piston. The quantity and thickness of shimming washers varies with each engine.

5. NOTE: if, for any reason, the shimming washers have been lost or have gotten mixed up, send the magneto side engine case, the crankshaft assembly with main bearings, the cylinder, and the cylinder head back to your OSSA distributor, who has a duplicate set of factory assemblyline tools for finding out how many crankshaft shims are required for any particular engine.

6. To mount the crankshaft assembly in the primary-side engine case, heat the case with a torch or on a small stove, directing the heat against the inside of the case, around the crankshaft boss, so as to avoid damaging the seal. Fit the shimming washers and then the OSSA seal guide to the primary-side drive shaft, and press the crankshaft assembly into he case by hand. The seal guide prevents the drive shaft from damaging the seal. When the crankshaft assembly has been positioned in the case, the seal guide will fall out ot the engine case.



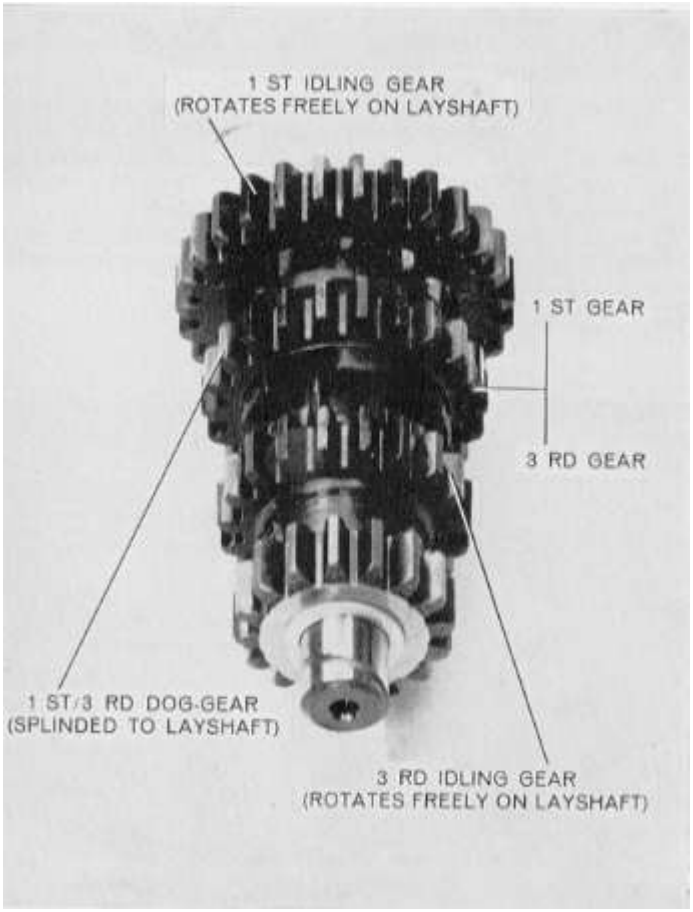
1. Chapter 3 consists of the following:

Section 1. How the Gearbox Works.

Section 2. Reassembling the Gearbox.

Section 1. How the Gearbox Works.

1. The OSSA engine has a constant mesh gearbox, which means that all of the gears on the main shaft are always engaged with the gears on the layshaft.



2. The main shaft is driven by the clutch. In 1st, 2nd, or 3rd gear, one of the gears on the main shaft drives its matching gear on the Iayshaft. The transfer gear at the end of the lay shaft then drives the countershaft gear, which then drives the countershaft sprocket. The main shaft normally rotates freely inside the countershaft.

3. For 1st, 2nd, or 3rd gear, each gear set consists of three gears. The first of these three gears is splined to its shaft; it rotates whenever its shaft rotates. However, the gear with which it is meshed on the other shaft is not splined, but can rotate freely without rotating the shaft. Next to this freely rotating gear on the second shaft is a dog gear. The dog gear is splined to the second shaft and can be moved back and forth along the shaft by means of a shifter fork. The dog gear can be locked into the freely-rotating gear by means of dogs or gear segments. When the shifter fork locks the dog gear into engagement with the freely-rotating gear, the freely-rotating (idling) gear is then locked

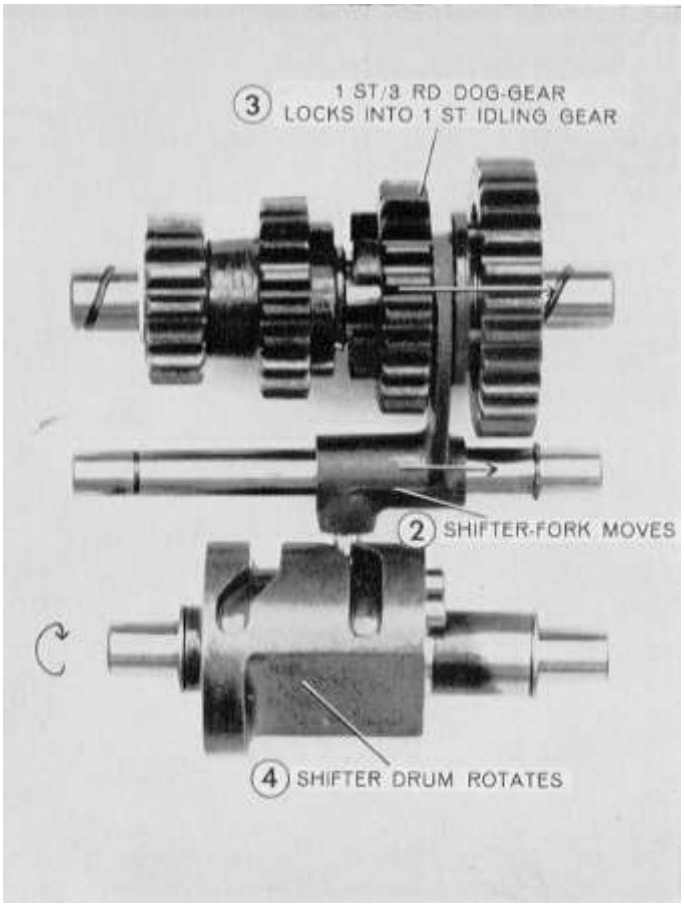
to its shaft, and power is transmitted through this particular set of gears from the main shaft to the layshaft.

4. In 4th gear, a dog gear at the end of the main shaft locks itself to the countershaft gear, bypassing the lay shaft entirely.

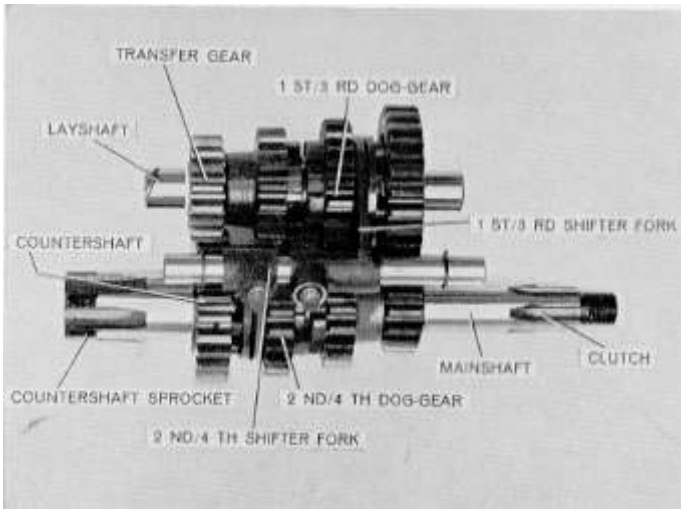
5. When you use the foot shift lever to change gears, the selector shaft rotates. The selector then rotates the shifter drum by ratcheting the pegs atop the shifter drum.

6. The shifter drum has two cam grooves cut into its surface. Follower pegs on the shifter forks ride in these cam grooves in the shifter drum. When the shifter drum is rotated, the shifter forks are moved back and forth along their shaft.

7. The faces of the shifter forks are fitted into grooves cut into the dog gears. The shifter forks slide these dog gears along the main shaft. You should be able to draw a straight imaginary line through the middle and the and the lay shaft, which results in a gearshift.

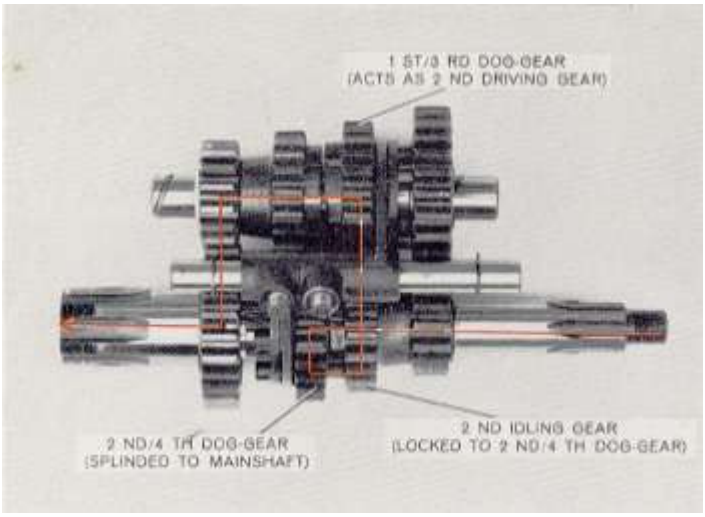


8. In order to avoid over shifting and under shifting, the selector shaft is fitted with a hairpin spring that limits the travel of the selector. In addition, the shifter drum has a number of dimples cut into its bottom surface; the detent plunger engages in a dimple when the shifter drum is rotated the correct amount.



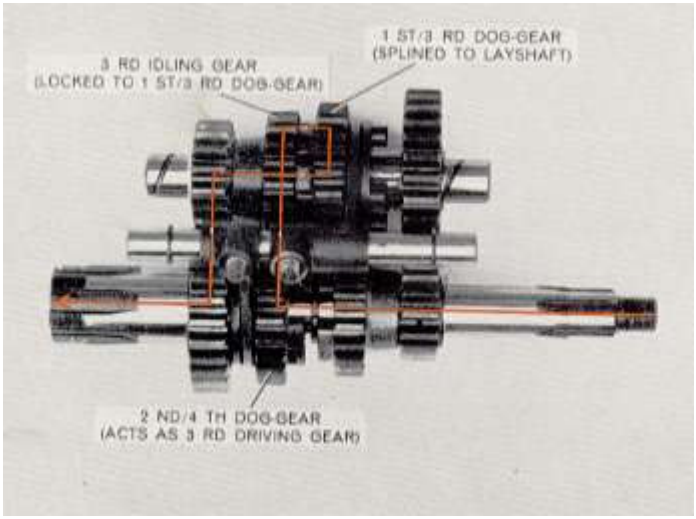
9. To place the gearbox in 1st gear, the lst/3rd shifter fork moves the lst/3rd dog gear on the lay shaft into engagement with the 1st idling gear on the lay shaft. Power is transferred through the 1st driving gear on the main shaft (nearest the clutch) to the 1st idling gear on the lay shaft, which is locked to the lay shaft by means of the 1st/3rd dog gear. Power is transferred from the lay shaft to the countershaft by means of the transfer gear on the lay shaft, and the countershaft gear.

10. To place the gearbox in 2nd gear, the 1st/3rd shifter fork moves the 1st/3rd dog gear out of engagement with the 1st idling gear on the lay shaft. The 1st/3rd dog gear is now meshed with the teeth of the 2nd idling gear on the main shaft. The 1st/3rd dog gear (on the lay shaft) serves as the 2nd driving gear. On the main shaft, the 2nd/4th shifter fork moves the 2nd/4th dog gear into engagement with the 2nd idling gear. Power is transferred by means of the 2nd/4th dog gear and the 2nd idling gear on the main shaft to the 1st/3rd dog gear on the lay shaft.



11. To place the gearbox in 3rd gear, the 2nd/4th shifter fork moves the 2nd/4th dog gear on the main shaft out of engagement with the 2nd idling gear. The teeth of the 2nd/4th dog gear are now meshed with the teeth of the 3rd idling gear on the lay shaft; the 2nd/4th dog gear now serves as the 3rd driving gear. The lst/3rd shifter fork moves the 1st/3rd dog gear into engagement with the 3rd idling gear on the lay shaft. Power is

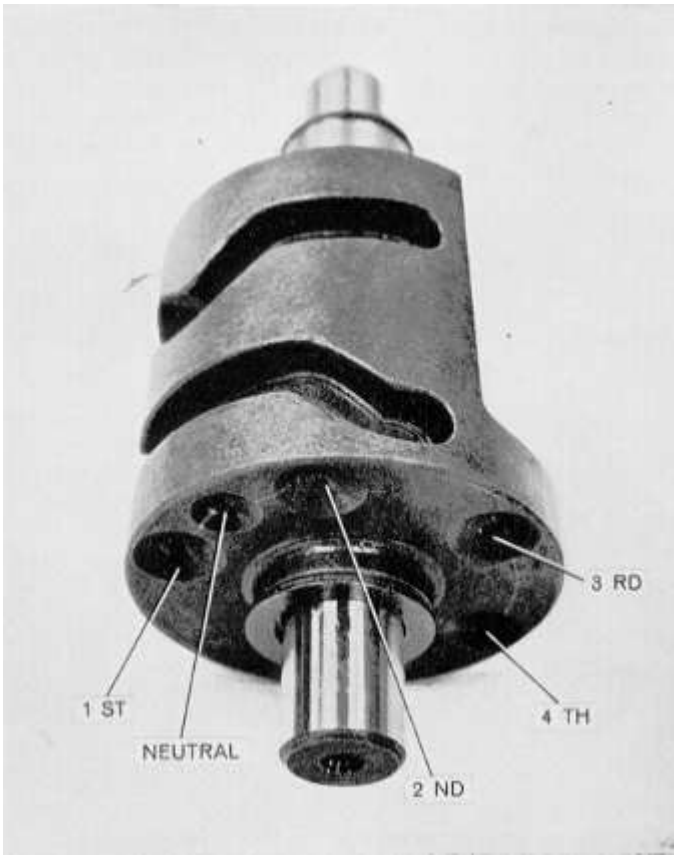
transferred by means of the 2nd/4th dog gear (which serves as the 3rd driving gear) on the main shaft, to the 3rd idling gear and the lst/3rd dog gear on the lay shaft.



12. To place the gearbox in 4th gear, the lst/3rd shifter fork moves the lst/3rd dog gear out of engagement with the 3rd idling gear on the lay shaft. At the same time, the 2nd/4th shifter fork moves the 2nd/4th dog gear into engagement with the countershaft gear. Power is transferred directly from the main shaft to the countershaft gear.

Section 2. Reassembling the Gearbox.

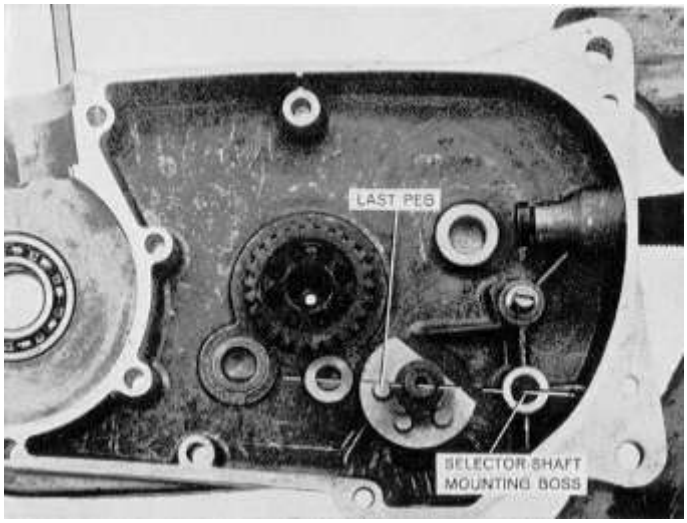
1. If you removed the countershaft from the magneto side engine case, you should install it now. From the inside of the case, press or tap the countershaft into its ball bearing. From the outside of the case, fit the countershaft spacer, the sprocket, the countershaft washer, and the countershaft nut. Fit the OSSA countershaft sprocket spanner to the countershaft sprocket. Fit the OSSA countershaft nut tool to the countershaft nut. Rotate the countershaft nut counterclockwise (CCW), and tighten the nut securely. With a small chisel and a mallet, bend up the countershaft washer against two flats of the nut.

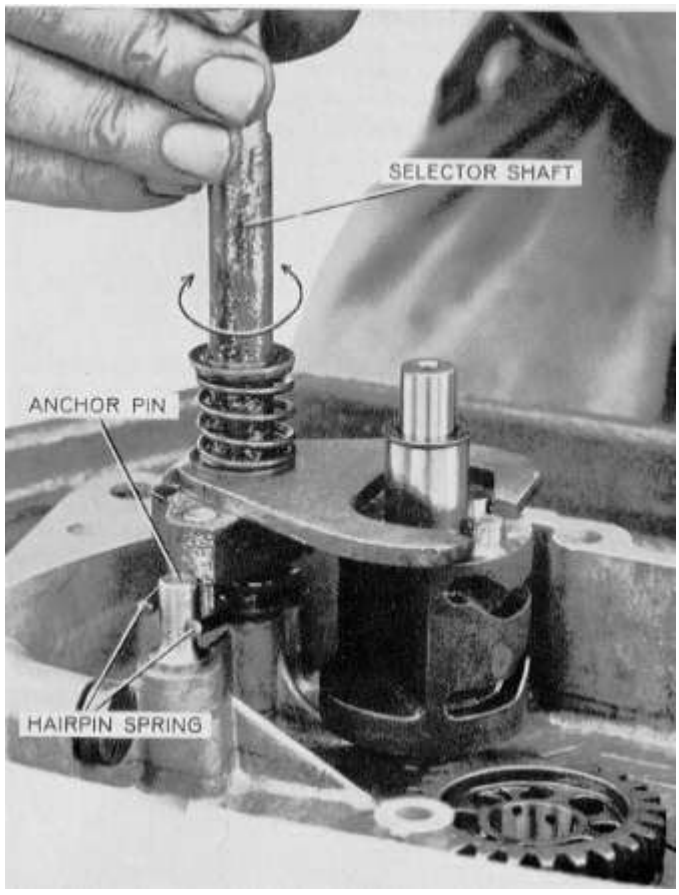


2. NOTE: When the gearbox was assembled at the factory, the correct clearances and tolerances were obtained by measuring the play of each shaft and fitting shimming washers, where necessary, to compensate. As you install each gearbox component, make certain that you install the shimming washers on their shafts. If you think that the shimming washers have become lost or mixed up, send the engine cases, the crankshaft assembly, the engine case screws, and the gearbox components to your OSSA distributor. He has a duplicate set of factory assembly line Jigs for checking the gearbox clearances.

3. Screw the detent plunger, with the large nylon washer, into the engine case, but do not tighten it.

4. Examine the bottom of the shifter drum. There are five dimples into which the detent can fit. Reading clockwise (CW) from the left, the first dimple is 1st gear. The last dimple is 4th gear. The small dimple, next to the first dimple, is neutral. Mount the shifter drum, with its washers, in its boss so that the detent is in the «neutral» dimple. There are three pegs atop the shifter drum. If the shifter drum is in «neutral», you should be able to draw a straight imaginary line through the middle of the last peg (reading clockwise), the middle of the shifter drum shaft, and the middle of the selector shaft mounting boss.

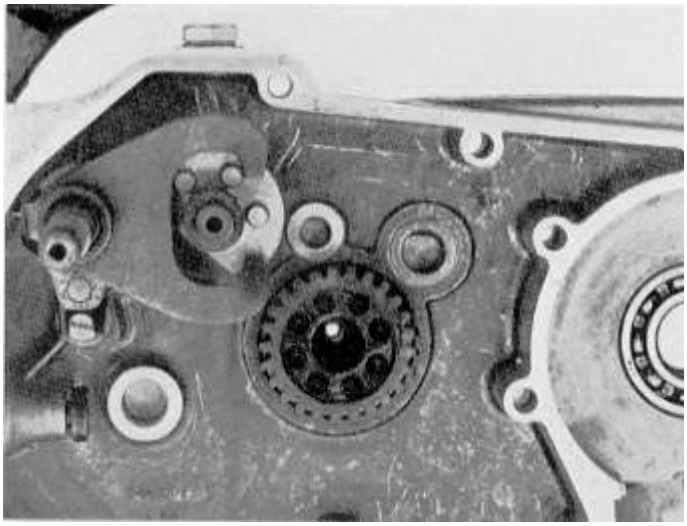


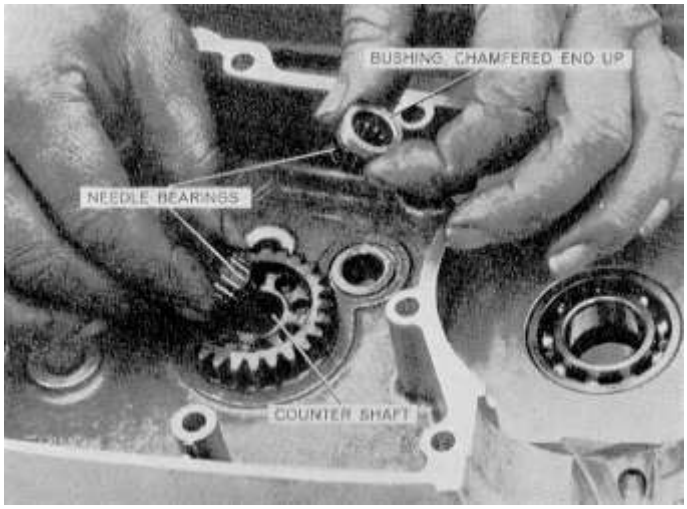


5. Fit the selector shaft, with its washer, to the mounting boss. Clip the legs of the hairpin spring to the anchor pin gently rotate the selector shaft. Ifit moves freely, then both legs of the hairpin spring are not parallel. Remove the selector shaft, and bend one of the legs of the hairpin spring to make both legs parallel when the spring is fitted lo the anchor pi Mount the selector shaft, and test to make certain that the shaft does not have any free play.

6. The first peg on the shifter drum will lie between the fingers of the selector. The peg should lie halfway between the ends of the two fingers. Rotate the shifter drum to the

3rd-gear position. There should be equal clearance between two of the pegs and the ends of the fingers. If not, remove the selector shaft and bend both legs of the hairpin spring in the opposite direction from which you wish to rotate the selector fingers. If you need to bend the legs, make certain that they are still parallel when you finish, so that the selector shaft does not have any free play. Remove the selector shaft, the shifter drum, and the detent from the engine case.



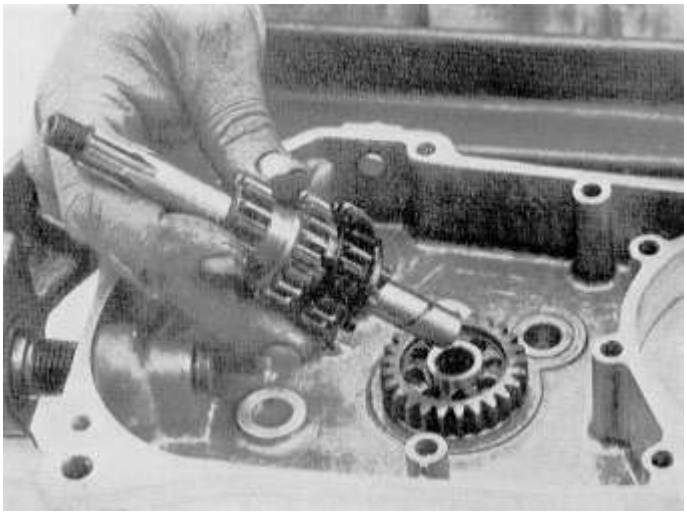


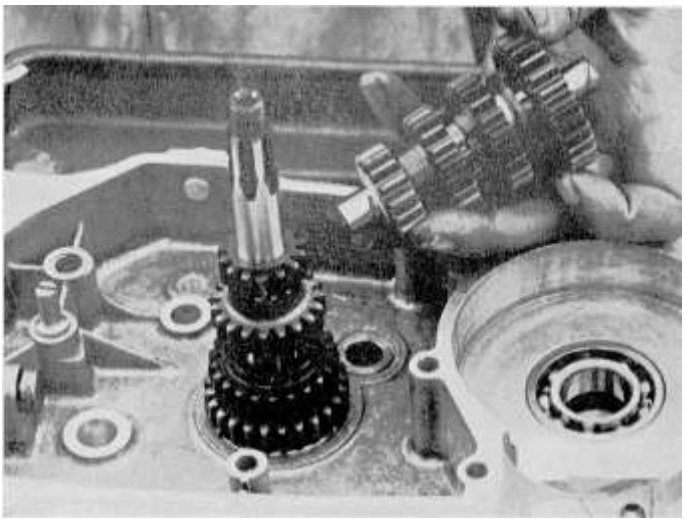
7. Insert the two needle bearings into the countershaft. Place the main shaft bronze bushing atop the needle bearings, with the chamfered side of the bushing facing up.

8. Insert the main shaft with all ofits washers, spiral-grooved-end first, into the countershaft.

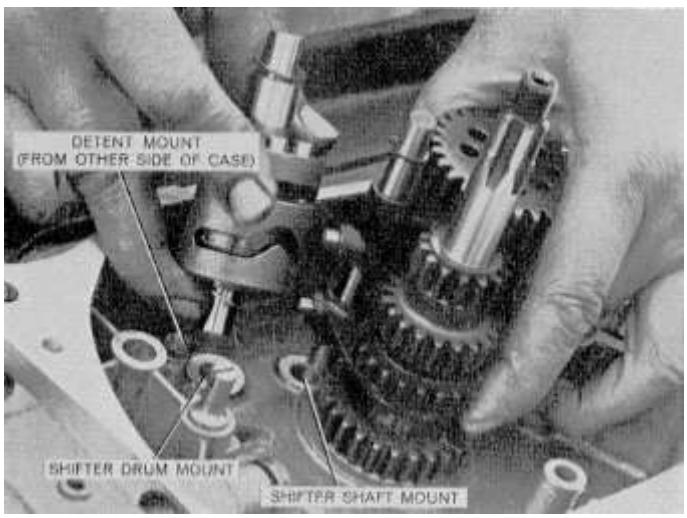
9. Insert the lay shaft, with its washers, into its mounting boss in the engine case. Mesh the lay shaft gears with the main shaft gears.

10. Insert the shifter fork assembly into its boss in the engine case; the fork with the longer body should be uppermost on the shaft. Work the bottom shifter fork (2nd/4th) into its groove in the 2nd/4th dog gear on the main shaft. Work the top shifter fork (lst/3rd) into its groove in the lst/3rd dog gear on the lay shaft. You will need to lift the main shaft and the lay shaft to insert the forks.





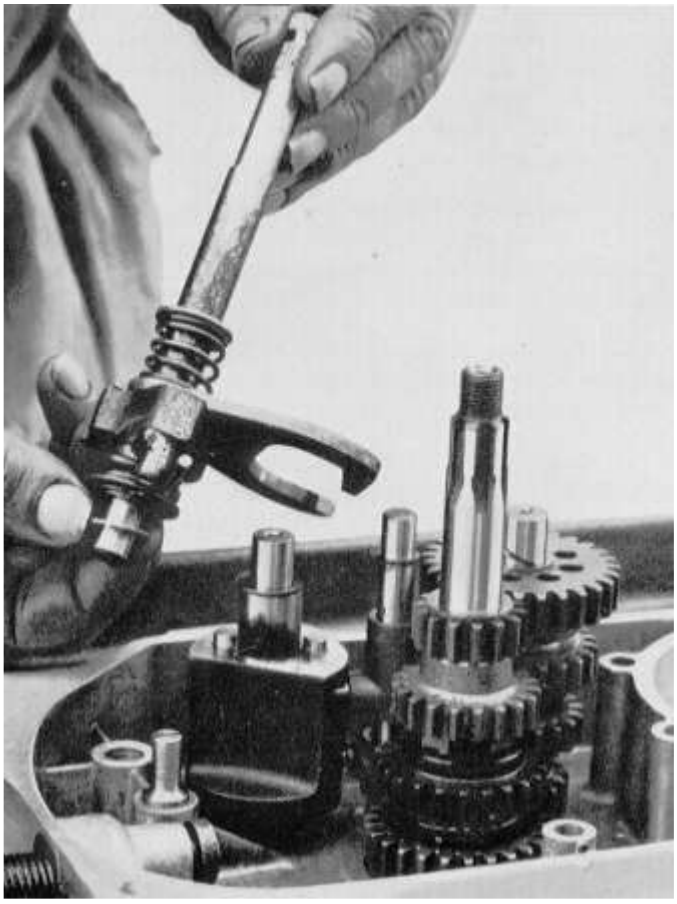
11. Fit the shifter drum, with its washers, to its boss in the engine case. Install it in the neutral position. Move the two dog gears up or down until they are in neutral. Lift the main shaft, the lay shaft, and the fork assembly. Engage the follower pegs of the shifter forks in the cam grooves of the shifter drum.



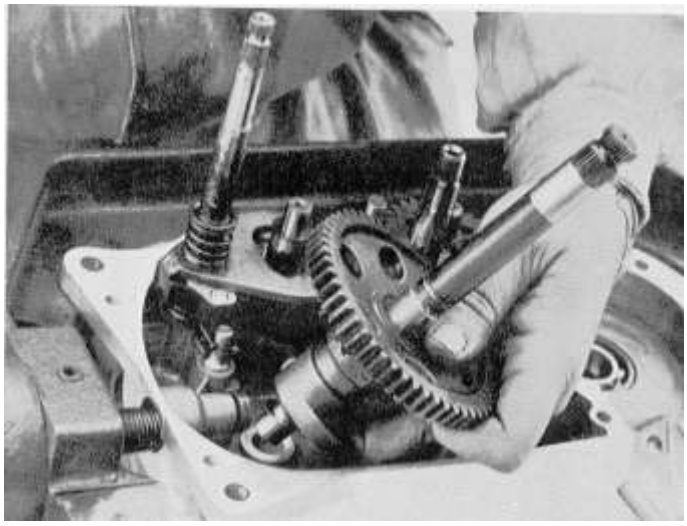
12. Install the selector shaft assembly in its mounting boss.

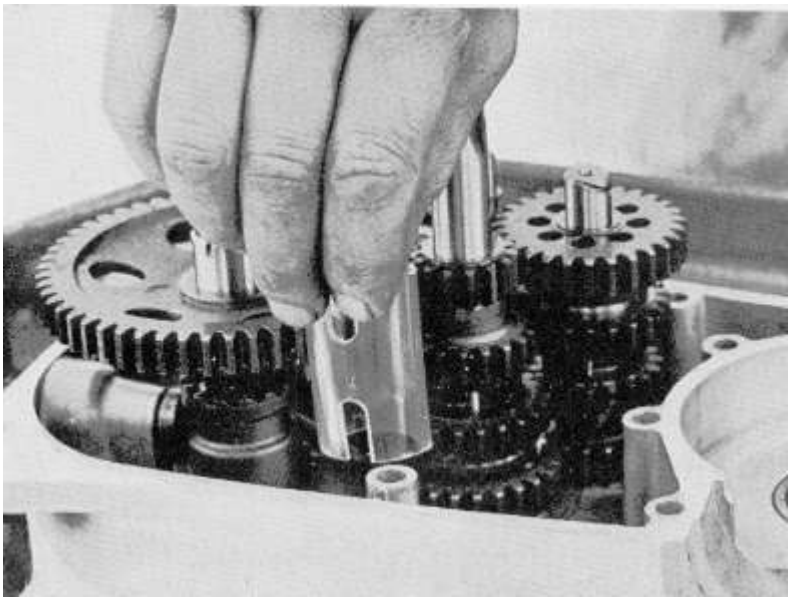
13. Mount the kickstarter shaft assembly in its boss, SO that the ramp will clear the large screw in the engine case. Then rotate the shaft counterclockwise (CCW) against its stop.

14. Fit the slotted plastic breather tube to the breather boss at the top of the case. Make certain that the slot faces upward; otherwise, all of the lubricant will escape when the engine is running.



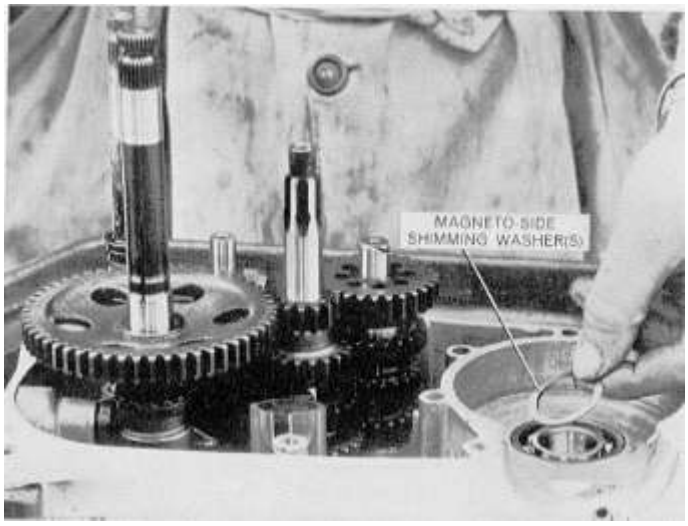
15. From the outside of the engine case, mount the detent assembly with the large nylon washer. Screw the threaded portion of the detent assembly with the large nylon washer. Screw the threaded portion of the assembly halfway into the engine case.





1. Chapter 4 consists of the following:

Section 1. Assembling the Engine Cases.
Section 2. Assembling the Primary side Components.
Section 3. Finding the Piston Clearance.
Section 4. Fitting a New Liner.
Section 5. Assembling the Top End Components.
Section 6. Assembling the Magneto Side Components.
Section 7. Installing the Engine in the Motorcycle.



Section 1. Reassembling the Engine Cases.

1. Smear both sides of a new center case gasket with grease. Do not use gasket cement. Fit the gasket to the magneto side engine case.

2. Oil the gearbox components, using Full Bore SAE 80 Racing Gearbox Lubricant, or the equivalent.

3. Place the magneto side crankshaft shimming washers atop the main bearing in the magneto side engine case. Place the primary side engine case (containing the crankshaft assembly) atop the magneto side engine case. Hold the kick starter shaft so that it is centered in its hole in the primary side engine case. and tap the case at both ends with a rawhide mallet to mate it with the magneto side engine-case.

4. With a mallet and a drift, seat the three hollow locating dowels in the front and rear engine-case bosses. However, do not yet turn the engine over to mount the engine-case screws, because the engine cases can still separate easily.

5. Insert the front engine-case bolt into its bosses. Fit the flat washer, the spring washer, and the nut. Run the nut down finger tight, and tighten it 1/2-turn with a 14 mm socket.

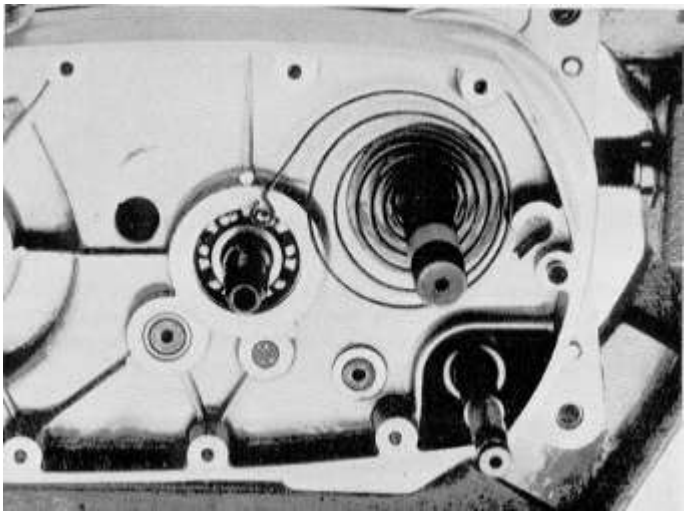
6. Turn the engine over so that the magneto side engine-case faces up. Mount the 11 engine-case screws. The two screws at the rear of the engine are shorter than the rest. The flat-head screw goes at the bottom of the engine case.

7. Select (or grind) a socket mounted screwdriver bit so that it fits snugly in the slots of the engine-case screws. Fit the screwdriver bit to a 0-15 ft/lb torque wrench. Torque each engine-case screw, beginning in the center of the case and working outwards, to 12 ft/ibs of torque. Torque the 14 mm front engine-case bolt and nut to 12 ft/Ibs. Tighten the detent with the nylon washer.

Section 2. Assembling the Primary Side Components

1. Turn the engine over so that the primary side engine case faces up. Place one of the washers on the kick starter shaft.

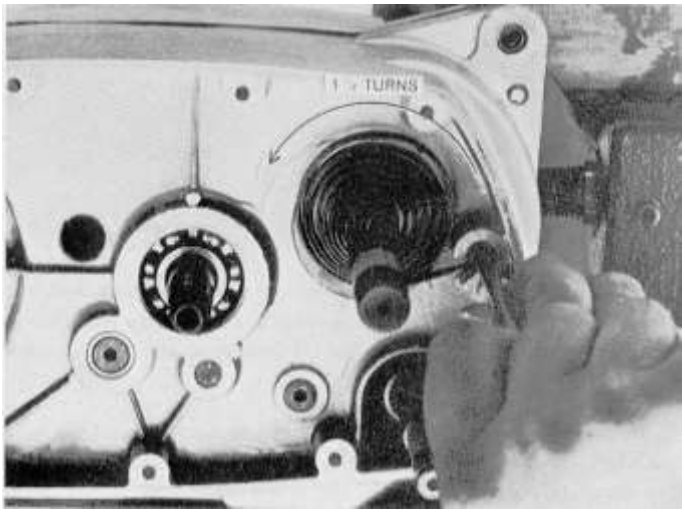
2. Fit the kick starter spring to the kick starter shaft, with the looped end of the spring facing left. With a pair of needle nose pliers, work the other end of the spring into its mounting hole in the kick starter shaft.



3. Fit a tapered drift into the looped end of the kick starter spring, and tighten the spring 1 1/2 turns. The tapered drift will now be positioned above the kickstarter-spring retaining boss. With a screwdriver, work the looped end of the spring off the tapered drift and into its retaining boss. Press the spring down flat against the washer beneath it.

4. Place the other large washer on the kick starter shaft.

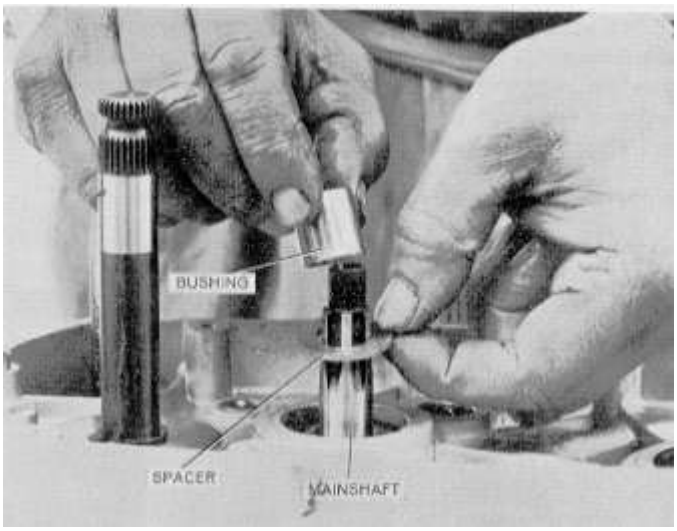
5. With a pair of snap ring pliers, fit the snap ring to its groove on the kick starter shaft just above the top washer.



6. Fit the kick starter lever to its splines on the kick starter shaft, and test to make sure that the kick starter shaft operates correctly. Remove the kick starter lever.

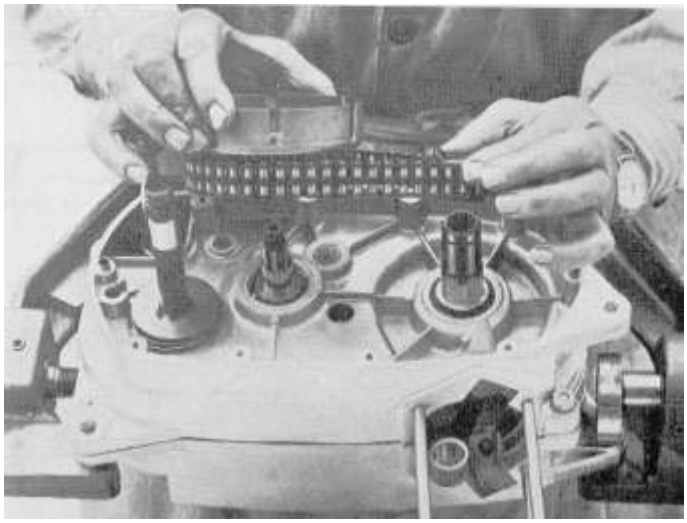
7. Place the flat spacer on the main shaft, atop the ball bearing assembly.

8. Place the clutch bushing on the main shaft, and bottom the bushing against the flat spacer.

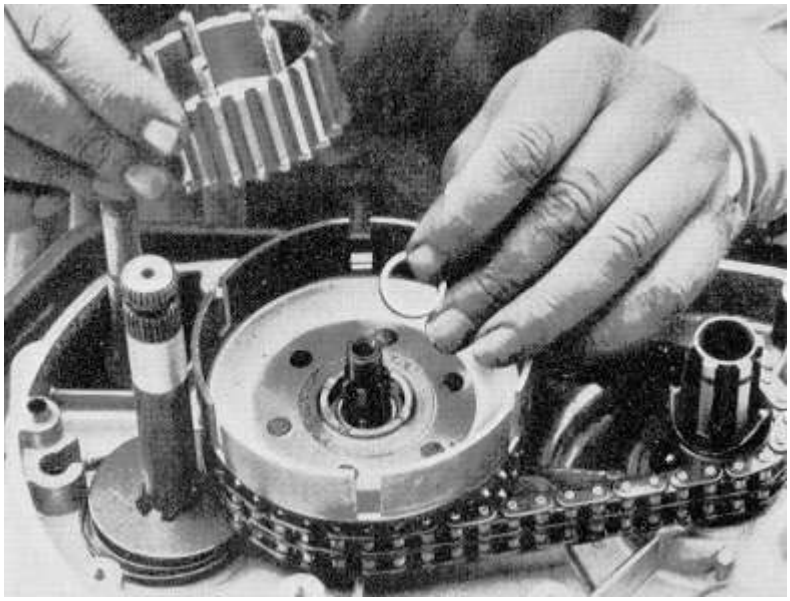


9. Clean all oil or grease from the primary side crankshaft, and from the inside of the cush-drive shaft, because the cush-drive shaft has an interference fit on the crankshaft. Put the cush-drive shaft on the crankshaft, and tap it with a rubber mallet.

10. Assemble the primary chain to the engine sprocket and the outer clutch hub with the master link spring clip facing the clutch hub. Fit the outer clutch hub to the main shaft, and at the same time, fit the engine sprocket to the cush-drive shaft.



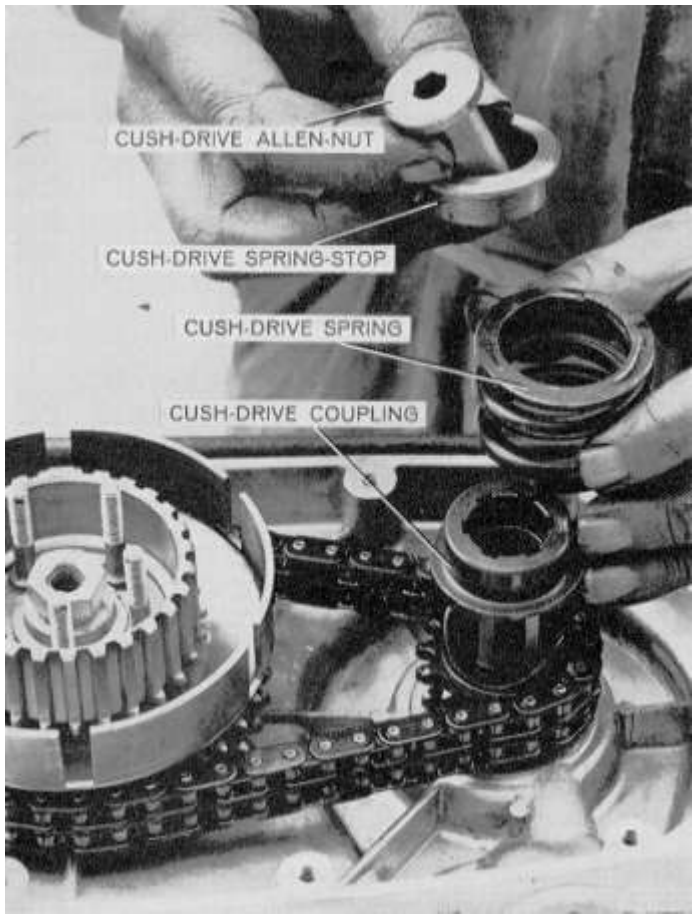
11. Place the short spacer tube on the main shaft, so that it bottoms against the clutch needle bearing. Put the inner clutch-hub to the main shaft. Align the splines of the inner hub with the splines of the main shaft, and work the hub down against the short spacer tube.

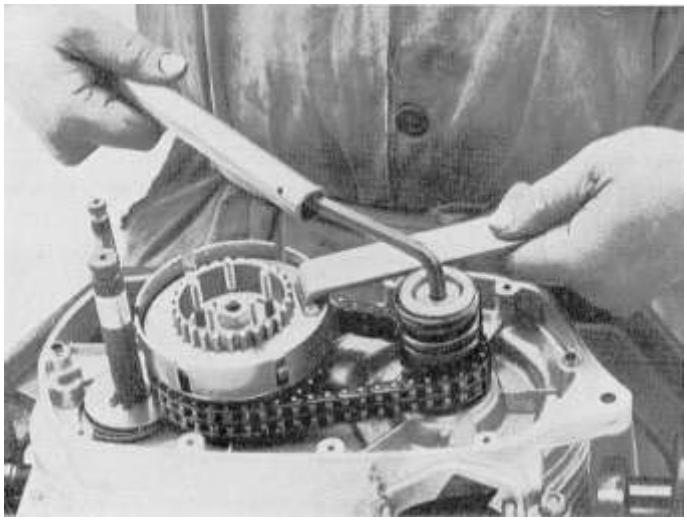


12. Put the lock washer and the clutch nut on the main shaft. Run the clutch nut down finger tight.

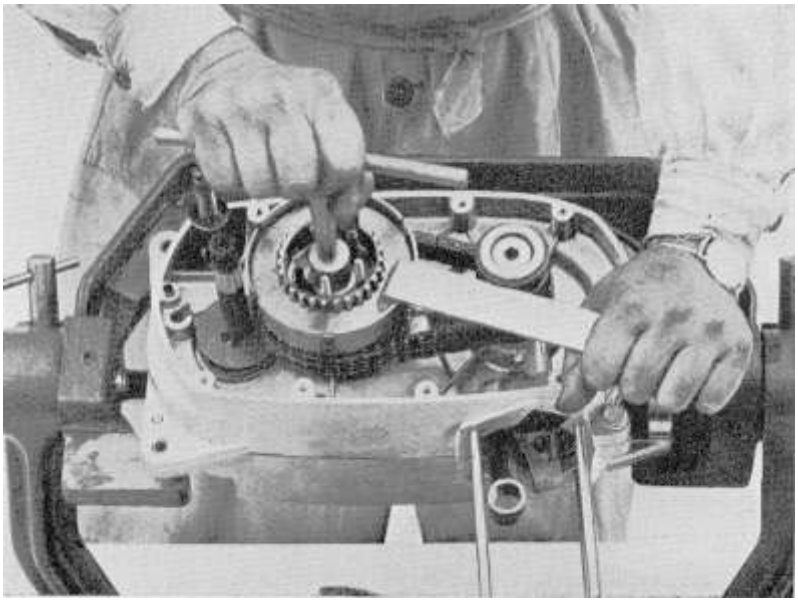
13. Place the cush-drive coupling on the cush-drive shaft. Next, fit the cush-drive spring and the cush-drive spring stop, with the flanged end of the spring stop facing upward.

14. Screw the Allen nut to the threads of the crankshaft.





15. Fit the OSSA clutch holding tool to the hubs of the clutch. Rotate the hubs clockwise (CW) until the handle of the clutch tool bears against the cush-drive shaft. Insert the OSSA 9 mm Allen wrench into the Allen nut. Fit a length of pipe to the end of the wrench for greater leverage, and tighten the Allen nut securely.

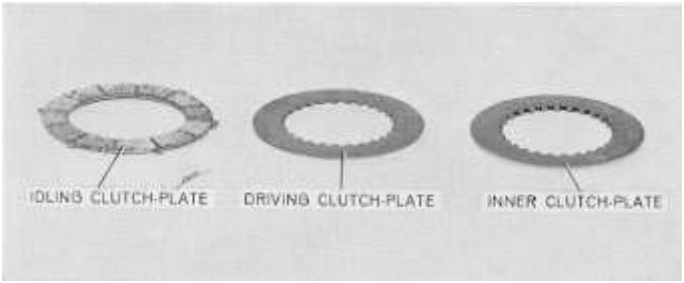


16. With the clutch tool still in position, fit a 19 mm socket on a 0-100 ft/lbs torque wrench to the clutch nut, and torque the nut to 60 ft/lbs.

17. Spin the inner clutch hub to make certain that the inner hub can rotate while the outer hub remains still.

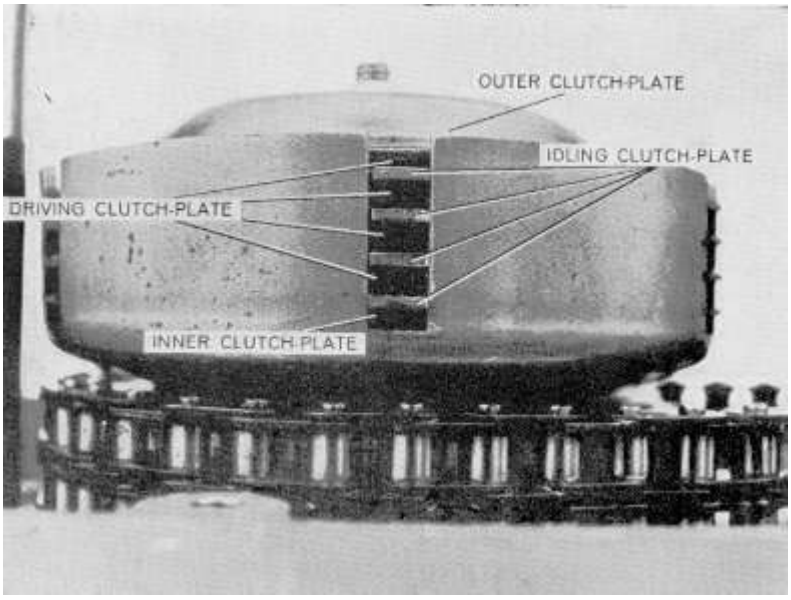
18. Fit the inner clutch plate to the clutch. The inner plate has plain faces and is thicker than the other plates. Oil the plate.

19. Fit an idling clutch plate, which has cork inserts. Oil each plate as you insert it.



20. Check all of the driving clutch plates (with plain metal surfaces) to make certain that they are all fIat. If any of these plates are bent or bowed, discard them.

Fit a driving plate to the clutch.

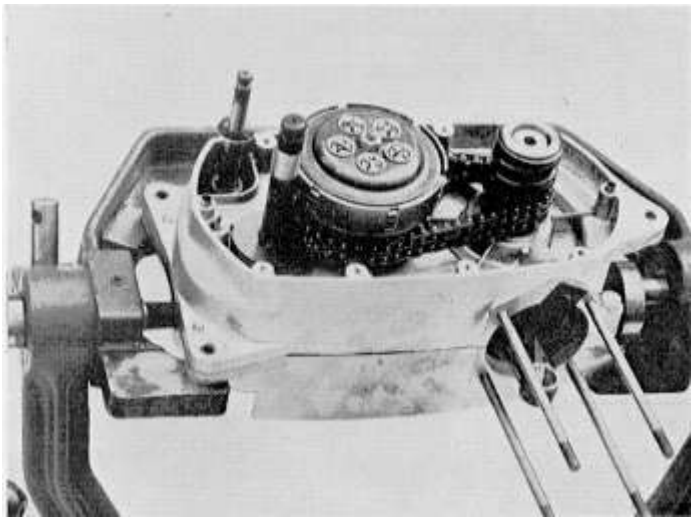


21. Fit another idling plate; then another driving plate; and continue to alternate the two types. There are four driving plates and four idling plates. The last plate will be a driving plate.

22. Fit the outer clutch plate. Fit spring cups, springs, and nuts to the five studs protruding from the outer clutch plate. With the spanner screwdriver, tighten each nut until the bottom ofits groove is level with the bottom of the cotter pin hole drilled in the stud.

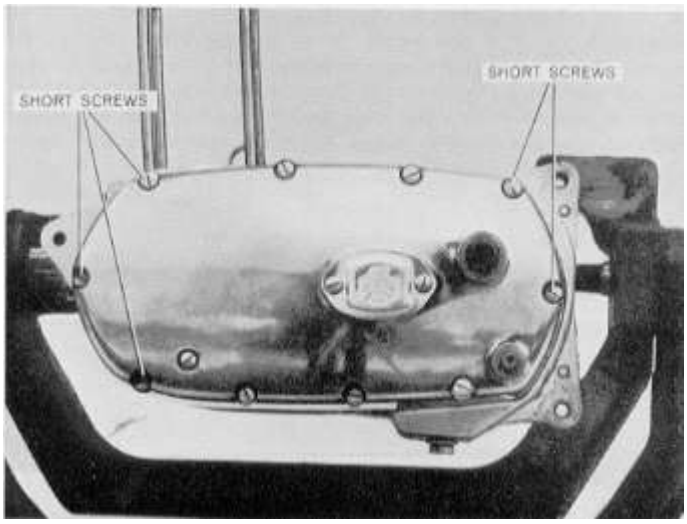
23. Rotate the clutch and check to see if the outer plate is canted. If so, mark the highest point on the outer plate. Tighten the clutch spring nut(s) nearest the high point, and back off the other nuts, until the outer plate is level. Install the cotter pins.

24. Place the flat washer and then the spring washer on the selector shaft.



25. Grease both sides of a new primary-case gasket, and fit the gasket to the primary side engine case.

26. Insert the two locating dowels into their mounts in the primary case. Fit the primary case to the engine case carefully, and tap the primary case with a rubber mallet to seat it.



27. Install the 10 primary-case screws. Three of the five short screws go to the front of the case; the other two go to the rear and the top-rear screwholes.

28. If the primary gasket protrudes from the cases, trim it which a knife.

29. Fit the footshift lever to its splines on the selector shaft, and work the lever to check the action of the selector shaft. Remove the footshift lever.

Section 3. Finding the Piston Clearance

1. Wash the cylinder in hot, soapy water and rinse it thoroughly. Allow the cylinder to dry, or blow it dry with an air gun.

2. Let the cylinder and the piston stand for two hours at room temperature (65-70 degrees F.).

3. With an inside micrometer (or a dial indicator fitted to a bore-measuring instrument), measure the inside diameter of the cylinder liner an inch or so down from the top, at the front and rear.

4. Now measure the outside diameter of the piston. Use a micrometer, and measure near the bottom of the skirts, at right angles to the wrist pin hole.

5. Subtract the outside diameter of the piston from the inside diameter of the liner to find the piston clearance.

6. In the 1967 230 cc street and trail models (Wildfire, Pioneer, Plonker), the piston clearance should not be less than .02-03 mm, or more than .06 mm.

7. In the 1967 230 cc scrambler model (Stiletto), the piston clearance should not be less than .05-.06 mm, or more than .10-12 mm.

8. Another way to measure the piston clearance is to place the cylinder on the bench; drop an axle nut on. the bench inside the cylinder; and mount the piston upside down in the. cylinder, with the shorter (intake) skirt facing the rear of the cylinder, and the longer (exhaust) skirt facing the front of the cylinder. Because the piston crown is resting on the axle nut, the ends of the piston skirts will be within 1"-2" below the top edge of the cylinder liner. Insert a feeler gauge between one of the piston skirts and the cylinder to determine the amount of piston clearance.

9. If the old piston is worn beyond tolerance, fit a new piston.

10. If the cylinder is worn so much that the clearance will still be too great when you fit a new piston, fit an oversize piston instead. The 1st oversize piston is .2 mm larger in diameter than the standard piston. The 2nd oversize piston is .4 mm larger in diameter than a standard piston. If necessary, bore and hone the cylinder to obtain the correct clearance with the oversize piston. Allow the cylinder to cool before measuring it again.

Section 4. Fitting a New Liner

1. If the cylinder liner has worn so badly that an oversize piston will not correct the condition, you will need to fit a new cylinder liner.

2. Put the new liner in the refrigerator and chill it thoroughly.

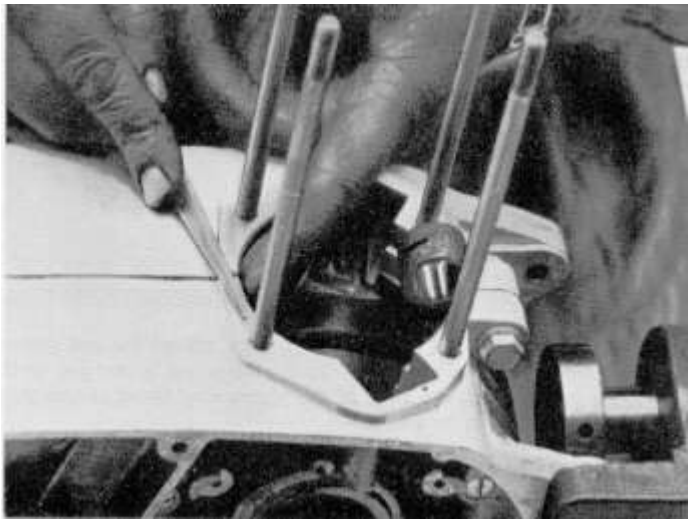
3. ln order to remove the old liner, suport the cylinder upside down in an oven, in such a way that the liner is free to drop out of the cylinder after reaching a temperature of 450-540 degrees F. Allow the old liner to drop out.

NOTE: do not heat the cylinder to a temperature greater than 750 degrees.

4. Make certain that the new liner and the inside of the cylinder are very clean, if necessary, allow the cylinder to cool, clean it thoroughly, and reheat it before inserting the new liner.

5. While the cylinder is hot, insert the new liner, and align the ports with those in the cylinder.

6. Support the cylinder, right-side up, so that the bottom of the liner does not touch anything. Place a heavy weight on the flange of the liner, to keep it from shifting its position while the cylinder cools.

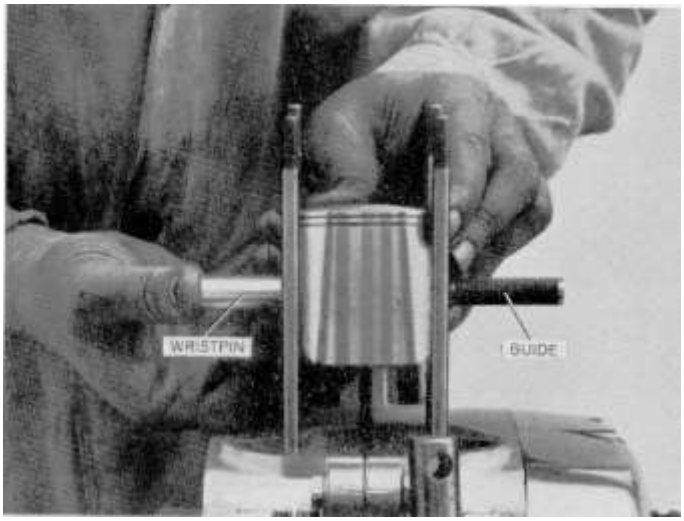


Section 5. Assembling the Top End Components

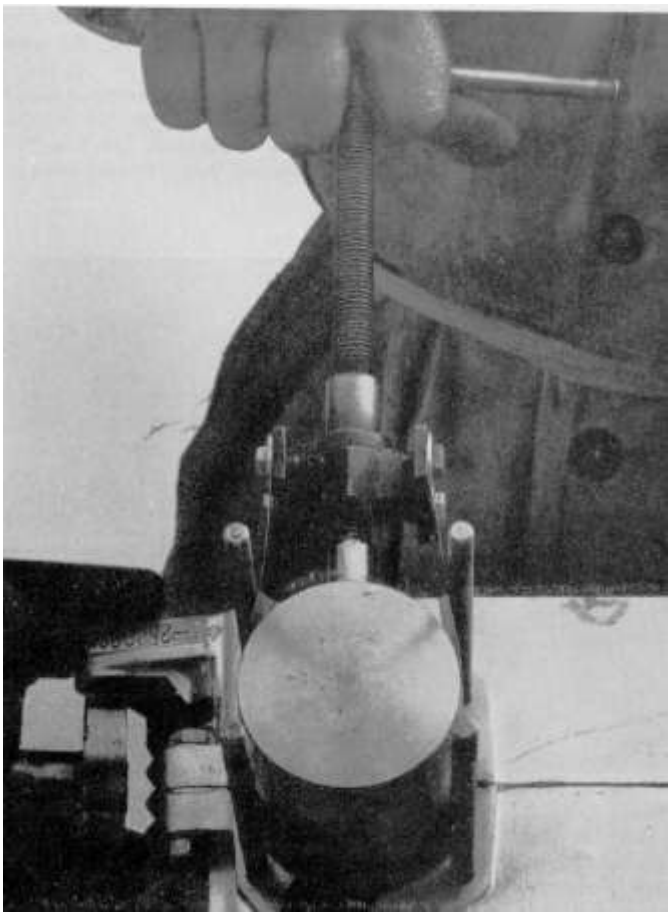
1. With a knife, trim away any centercase-gasket material protruding from the engine cases at the cylinder bosses. Squirt oil into the two holes drilled into the cylinder bosses.

2. Pull the con rod up to the TDC position. Wrap a shop rag around the con rod to prevent circlips or bearings from falling down into the cases.

3. Start the wristpin in one side of the piston. Fit the wristpin needlebearing to the con rod. Position the piston on the con rod, with the short skirt of the piston facing the rear of the engine. Butt the OSSA wristpin guide against the end of the wristpin that protrudes from the piston.

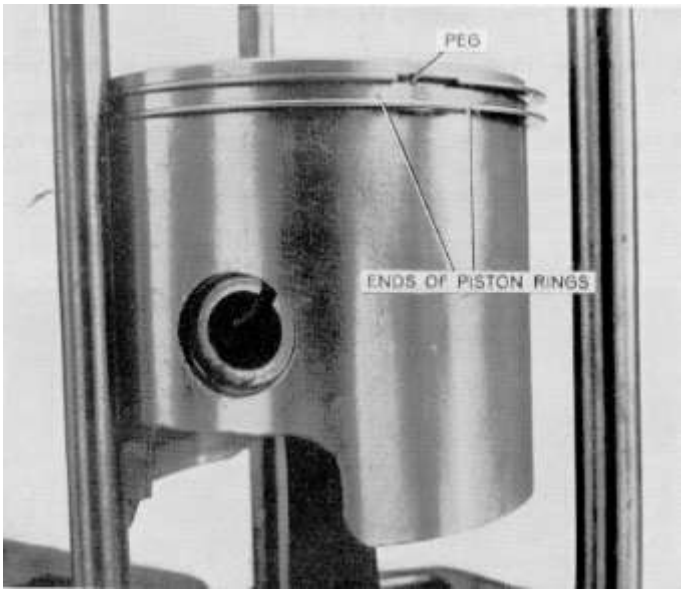


4. With one hand, grasp the piston to prevent bending the con rod. With the other hand, press against the wristpin guide to push the wristpin into position in the piston. If the wristpin is tight, and you cannot push it into position, remove the guide and fit a wristpin driver. Press the wristpin into position. Do not attempt to position the wristpin by hammering it with a mallet, because you run the risk of bending the con rod.



5. Using a pair of needle-nose pliers, insert a new wristpin clip in the groove at each end of the wristpin boss. You should not be able to rotate the clips freely in their grooves. If a clip is loose in its groove, remove it, spread it with pliers, and install it again.

6. Grease a base gasket on both sides. Fit the gasket to the through studs, and work the gasket down against the cases.



7. Clean the piston-ring grooves and the rings. Mount the two piston rings in their grooves in the piston. Each groove has a tiny peg in it. Center the peg between the ends of the piston ring. Make certain that neither ring can bind in its groove.

8. Fit the cylinder to the cylinder-head studs, and work the cylinder downward until it rests against the top of the piston. With your fingers or a strap, compress the rings, being careful not to allow either ring to ride up over the peg in its groove. Carefully work the cylinder down over the piston, and seat the cylinder against the cases.

9. Inspect the mating surfaces of the cylinder head, the head gasket, and the top of the cylinder. Make certain that these surfaces are smooth and clean.

10. Fit the head and the head gasket to the cylinder. The higher ends of the cooling-fins face the front of the engine.

11. Fit the flat washers to the cylinder-head studs. Mount the four cylinder-head nuts, and run them down finger-tight. Fit a 12 mm socket to a 0-15 ft/lbs torque wrench, and torque the cylinder-head nuts to 3 ft/lbs, in the following sequence: 10 o'clock; 4 o'clock; 8 o'clock; 2 o'clock. Repeat the sequence, torqueing the nuts 3 ft/lbs each time around, until the cylinder-head nuts have all been torqued to 12 ft/lbs.

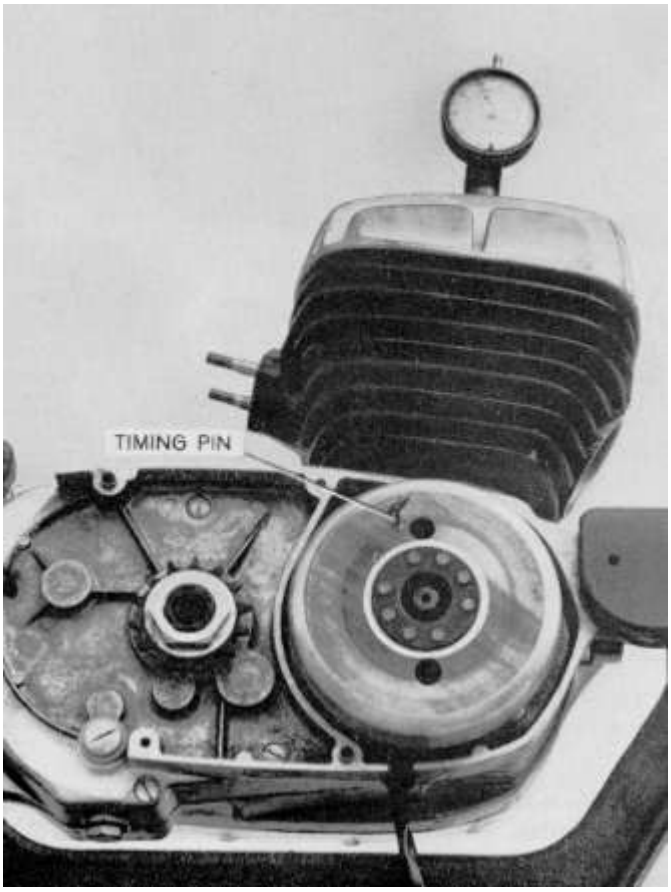
NOTE: if you attempt to tighten the cylinder-head nuts without a torque wrench, or with a torque wrench that reads more than 25 ft/lbs, you run the risk of warping the cylinder head or seizing the piston.

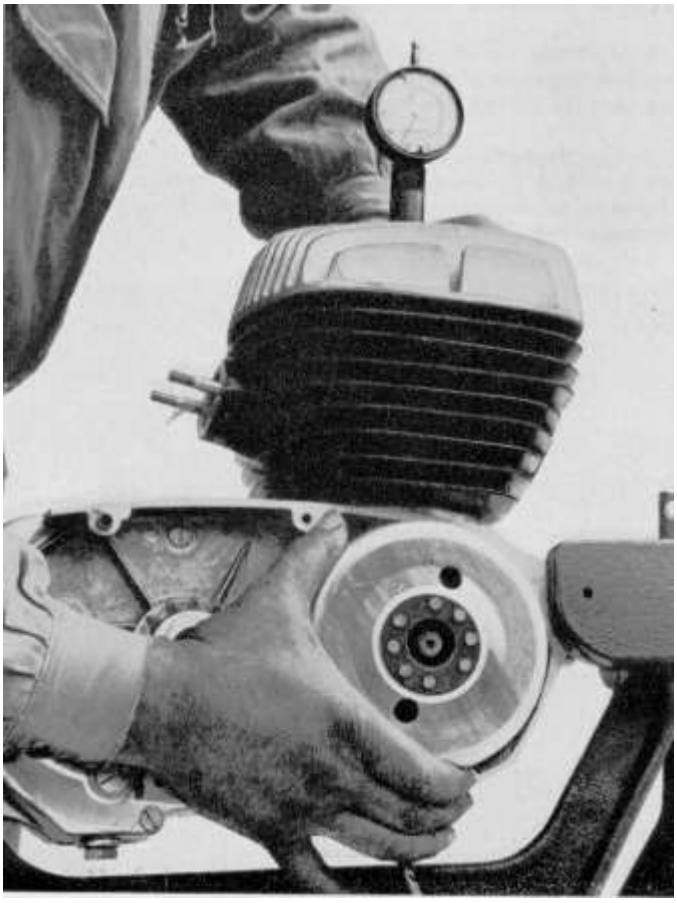
12. Install the sparkplug, to prevent trash from entering the sparkplug hole. Stuff the intake and exhaust manifolds with rags.

Section 6. Assembling the Magneto-Side Components

1. Before fitting the Woodruff key into its slot in the magneto-side crankshaft, peen one of the curved edges of the key so that it will fit tight. Then tap the key into its slot.

2. Remove the backing plate from the magneto flywheel. Position the backing plate on the engine case, and align the scribe marks that you made while disassembling the engine. Install the three backing-plate mounting-screws and tighten them.





3. Fit the rubber grommet to the slot in the bottom of the engine case and run the electrical wires, from the backing plate, down through the grommet.

4. Position the magneto flywheel in front of the crankshaft. Rotate the magneto flywheel until the slot is aligned with the Wood ruff key. Mount the flywheel on the crankshaft, pressing the flywheel into position with your hands.

5. There are two large holes in the face of the flywheel. To the left of one of these holes is a small hole. Rotate the magneto flywheel until the small hole is positioned at 11:00 o'clock. Insert the OSSA timing pin into the small hole in the flywheel. Work the flywheel back and forth until the pin drops into a second hole drilled in the backing plate. This is the position af which the spark plug will fire. Leave the timing pin locked into the backing plate.

6. Remove the spark plug, and install the spark plug adapter for the dial indicator. Fit the plunger into the adapter. Mount the dial indicator in the adapter, pressing the indicator downward until the needle begins to rotate, and then tightening the thumbscrew on the side of the adapter.

7. Rotate the face of the dial indicator, until the large needle indicates "0".

8. Remove the timing pm from the magneto flywheel. Rotate the magneto flywheel clockwise (CW), and count the number of complete revolutions of the large needle before it stops moving. As soon as the large needle stops moving, the piston is at Top Dead Center (TDC). Stop the magneto flywheel at that point, and add to the number of

revolutions the decimal fraction that the dial indicator now reads. For example, if the large needle passed "0" three times and stopped at a reading of "15", then the ignition timing is 3.15 mm Before Top Dead Center (BTDC).

9. The correct ignition timing is as follows for the different 230 cc
1967 models:
(1] Wildfire 3.25 to 3.50 mm BTDC.
(2) Pioneer 3.25 to 3.50 mm BTDC.
(3) Stiletto 3.25 to 3.50 mm BTDC.
(4) Plonker 3.25 to 3.50 mm BTDC.

10. If the ignition timing does not lie within the tolerances given above, remove the magneto flywheel (you may need to use the OSSA magneto flywheel puller). Loosen the three mounting screws on the magneto backing plate.

11. If the reading that you got was less than the minimum allowable. then the timing is "late", or retarded. To correct this condition, rotate the magneto backing plate counterclockwise (CCW); tighten the mounting screws; install the magneto flywheel, and check the timing again with the timing pin and the dial indicator.

12. If the reading that you got was greater than the maximum allowable, then the timing is "early", or advanced. To correct this condition, rotate the magneto backing plate clockwise (CW), and proceed as in Step 11 above.

13. When the timing is correct, remove the dial indicator and its adapter, and install the spark plug again.

14. Fit the magneto flywheel washer and nut to the crankshaft. Run the nut down finger tight. Fit the magneto flywheel holding tool. With a 22 mm socket on a 0-100 ft/lbs torque wrench, torque the magneto flywheel nut to 60 ft/lbs.

15. With a small screwdriver, remove the oil seal from the end of the countershaft (it you have not a already done so). Coat one of the push rods heavily with grease. Insert in into the countershaft. Use the other push rod to move it in against its seat. Remove the second push rod. Insert the ball bearing into the countershaft. Insert the second push rod, so that that ball bearing is positioned between the two push rods.

16. Fit the oil seal to the end of the second push rod, and press the oil seal into position in the countershaft.

Section 7. Installing the Engine in the Motorcycle

1. Fit the drain plug washer to the drain plug. Mount the drain plug, and tighten it with a 19 mm socket.

2. Fit the stem of a small funnel into the inspection hole in the primary case. Pour in 1000 cc of SAE 30 oil (for the United States, we recommend using Full Bore SAE 80 Gearbox Racing Lubricant).

NOTE: you will be able to add 1000 cc of lubricant only after having split the cases. Mount the other inspection plate screw.

3. Mount the engine from either side of the motorcycle. Insert the engine with the front mounting-lugs positioned above the front mounting brackets, and the rear mounting-lugs positioned beneath the rear mounting brackets. Work the rear of the engine upward, so that the rear mounting-lugs are positioned in their brackets. Work the front of the engine downward, so that the front mounting-lugs are positioned in their brackets.

4. Insert the four engine-mount bolts into the four engine-mount brackets. To each bolt, fit a flat washer, a spring washer, and a nut. Run each nut down finger tight, and then torque it to 14 ft/lbs.

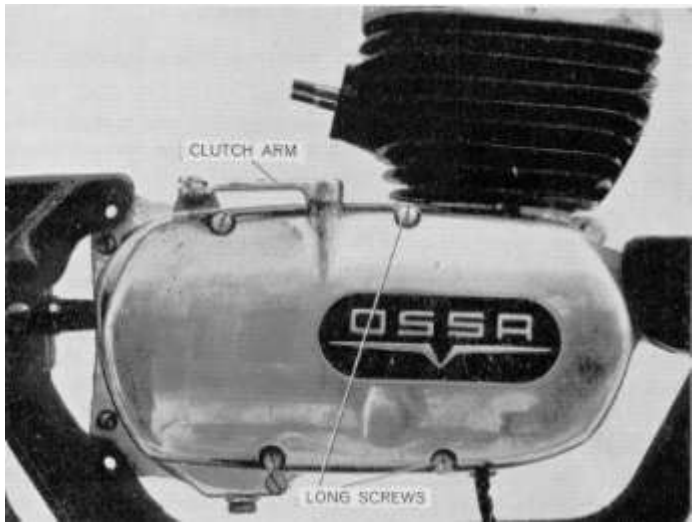
5. With the two 10 mm bolts, mount the HV coil to the top frame tube.

6. The electrical wiring harness is still dangling from the engine. Fit the harness into the clamps on the rear down tube. Note that two of the wires are fitted with spade clips; these go to the HV coil underneath the top frame tube. Clip the blue wire to the HV-coil terminal with a blue dot beside it. Clip the back wire to the terminal with a black wire to the terminal with a black dot beside it.

7. The rest of the wires in the harness go to the electrical junction block located near the top of the rear down tube. Fit each wire to the terminal post across from the wire of the same color that is already mounted, and tighten the terminal screw.
Tape the wiring harness to the rear down tube in two places, with high quality electrical tape.

8. Thread the rear chain on the countershaft sprocket and the rear sprocket. Attach the master link, making certain that the closed end of the spring clip faces the direction of chain travel. Adjust the rear chain, and spray it with lubricant.

9. Inside the magneto case, coat the clutch arm plunger heavily with grease to keep it inside its boss in the case. Check to see that the two locating dowels are in place. Fit the magneto case (which does not have a gasket) to the engine case. Install the four magneto case screws:
the two longer screws go to the front of the case; the two shorter screws go to the rear.



10. Wiggle the clutch arm atop the magneto case; it should have at least 1/3" of movement. If does not, the clutch adjusting screw is probably bottoming. To correct this, remove the inspection cover from the primary case. Loosen the lock nut on the adjusting screw protruding from the outer clutch plate. To increase the play in the clutch arm, rotate the screw counterclockwise. Tighten the lock nut.

11. With a spanner, pliers, or a large screwdriver, rotate the clutch arm clockwise (CW), in the same manner as if you had pulled the handlebar clutch lever. Insert the clutch cable fitting into the clutch arm. Release the clutch arm.

12. Fit the carburetor body to the intake manifold. Start the two nuts, and tighten them with an 11 mm wrench until they are compressing the rubber spacer. Stuff the top and the mouth of the carburetor body with clean shop rags.

13. Fit the gas tank and saddle mount to the motorcycle. With 10 mm wrenches, install the four bolts, washers, and two nuts that mount the gas tank (two of the bolts are mounted to the frame).

14. Mount the saddle. With the spanner screwdriver, install the rear saddle mount nut.

15. Position the rear fender on its mounts. Attach the taillight wire to the electrical junction block inside the taillight assembly. Install the tail light lens.

16. With two 10 mm wrenches, install the six nuts and bolts —and washers— that mount the rear fender to the motorcycle.

17. Position the plastic side panel against the rear down tube. On each side of the motorcycle, install the two screws with nylon washers; and the nut, bolt, and washers that mount the side panel to the motorcycle.

18. Fit the carburetor slide down into the carburetor body, with the cutaway in the slide facing the mouth of the carburetor. Position the carburetor top on the body, and install the two mounting screws in the carburetor top. Work the twist grip to make certain that the slide operates freely.

19. Fit the air cleaner to the mouth of the carburetor. With a screwdriver, tighten the mounting clamp.

20. Fit a new exhaust gasket to the exhaust pipe mount in the cylinder.

21. Position the exhaust system ready for mounting. Screw the threaded exhaust-pipe collar into the cylinder, being careful not to cross thread it. Do not tighten the collar.

22. Install the nuts and bolts that mount the muffler to the frame. Do not tighten them.

23. With the exhaust spanner, tighten the threaded exhaust pipe collar. Then tighten the muffler mount nuts and bolts.

Chapter 1. OPERATION

1. The 1967 230 cc OSSA is equipped with an electronic ignition system. The system consists of a magneto flywheel (rotor), a magneto backing plate, and a high voltage coil.

2. The magneto flywheel contains permanent magnets. When these magnets pass the low voltage coil on the magneto backing plate, an AC voltage is formed is the coil. The magneto is a simple alternator.

3. The current formed in the low voltage coil goes through a diode, which acts as half wave rectifier, chopping off the bottom half of the sine wave and forming a pulsating DC voltage. This DC voltage charges a capacitor (condensor) in the high voltage unit on the frame above the engine. The condensor is connected to the high voltage coil by means of a silicon controlled rectifier, which normally won't pass current.

4. When it is time for the spark plug to fire, a small magnet in the magneto flywheel passes by the "pickup" coil on the magneto backing plate. A small current is generated in this pickup coil. This small current is fed (as a bias voltage) to the silicon controlled rectifier. The silicon controlled rectifier now allows the capacitor (condensor) to discharge through the primary windings of the high voltage coil. As a result, a high voltage is formed in the secondary windings of the high voltage coil, and the spark plug fires.

5. To regulate the time at which the spark plug fires, you simply rotate the magneto backing plate in one direction or the other on its mounting boss. This changes the time at which the small magnet passes the pickup coil on the backing plate, allowing the silicon controlled rectifier to fire. See Part B, Chapter 4, Section 6 for details on regulating the ignition timing.

6. The ignition system does not have any contact breaker points, SO it will not need to be checked very frequently.

7. The magneto backing plate for all models except the scrambler is fitted with a number of other coils, which provide power for the various lights and the horn.

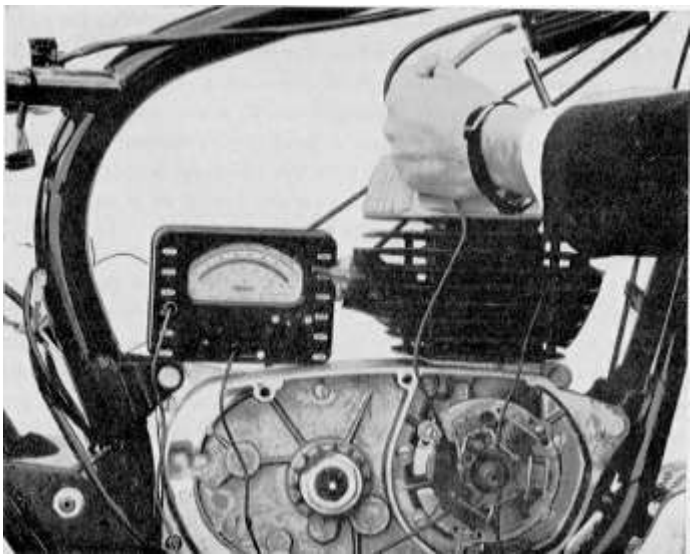
Chapter 2. TESTS

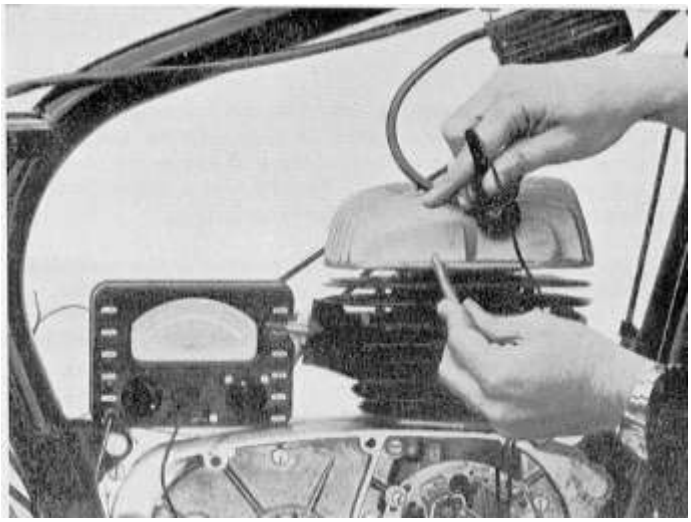
1. If the engine runs poorly, or won't fire, and you suspect electrical problems, remove the spark plug from the engine. Fit the spark plug cap to the plug, and hold the metal base of the plug against one of the fins on the cylinder head. Operate the kick starter, and watch and listen for a healthy spark (it should make a snapping sound).

2. If you get a feeble spark, or no spark at all, fit a new spark plug to the spark plug cap, and again check the spark with the kick starter.

3. If you still don´t get a good spark, disassemble and reassemble the spark plug cap, and again check the spark with the new spark plug.

4. If you still don't get a good spark, check the HV (high voltage) unit beneath the gas tank (you may need to remove the gas tank). Remove the black wire and the blue wires from the HV unit. Set an ohmmeter at R x 1, to read resistance in ohms. Attach the test leads from the ohmmeter to the two clips on the HV coil and read the meter. Remove the test leads and attach them in the reverse order. Take another reading. In both of the readings, you should get 25-35 ohms.

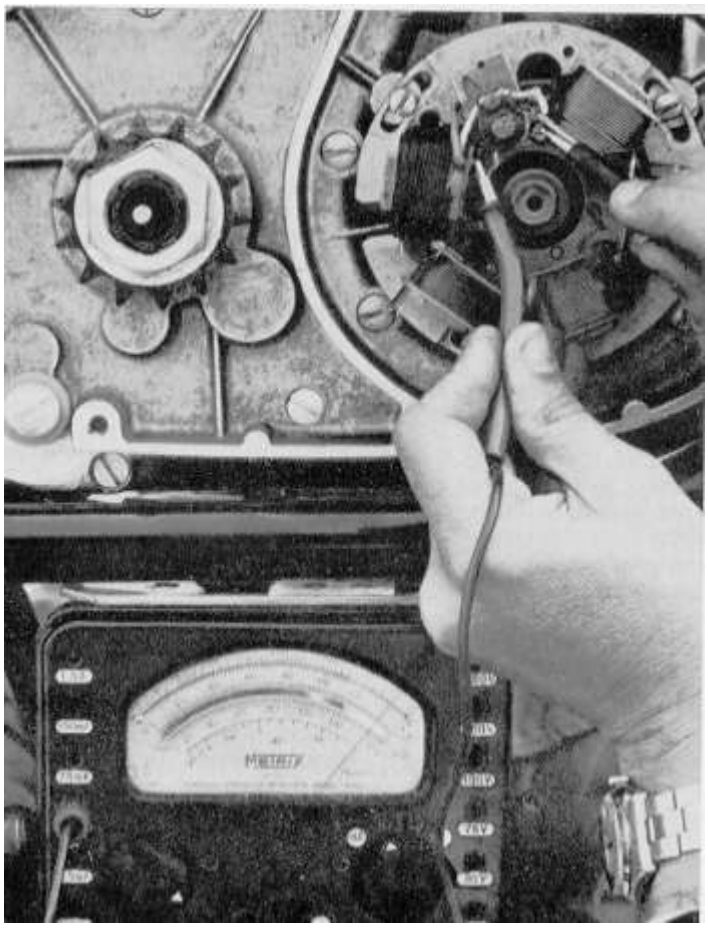




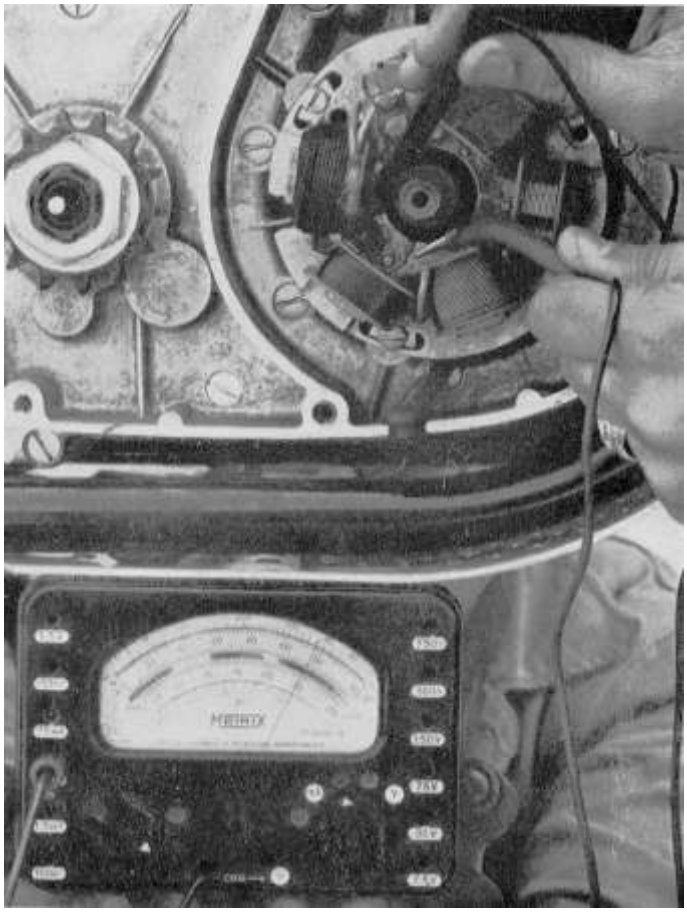
5. With the ohmmeter set at R x 100 or R x 1000, check the resistance between the clip inside the spark plug cap and ground (a fin on the cylinder head). You should get a reading of about 7000 ohms. If you don't get the specified readings in both of these tests, the HV unit is not working properly. You should discard it and fit a new one, making certain that the mounting lug makes a good ground against the frame. Attach the black wire to the clip with the black dot beside it; attach the blue wires to the clip with the blue dot beside it; if you reverse the wires you will probably ruin the HV unit.

6. If the HV unit gives good readings, remove the side panels from the motorcycle. Remove all of the wires leading to the engine from the electrical junction block. Remove the magneto flywheel and check the low voltage coil on the magneto backing plate. The low voltage coil has wiring of a larger diameter than the wiring in the other coils on the backing plate. Scrape the clear plastic insulation from the connections that you wish to measure.

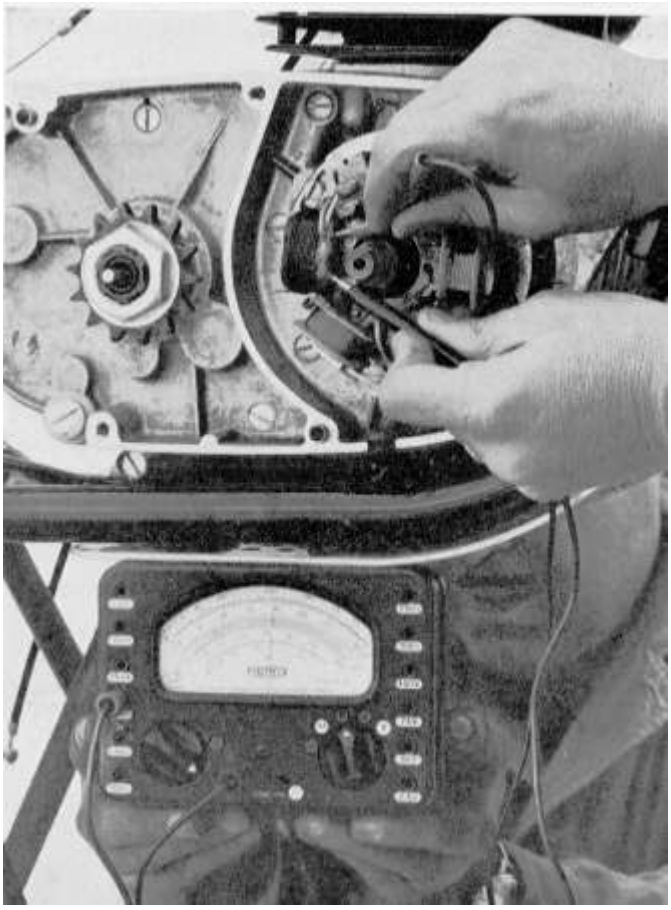
7. Measuring the resistance across the low voltage coil, you should get a reading of 160-185 ohms.



8. Checking the small diode on the backing plate near the low voltage coil, you should get a reading of 800-1200 ohms with the ohmmeter leads attached one way, and a reading of infinity (open circuit) with the test leads reversed, since the diode should only pass current in one direction.



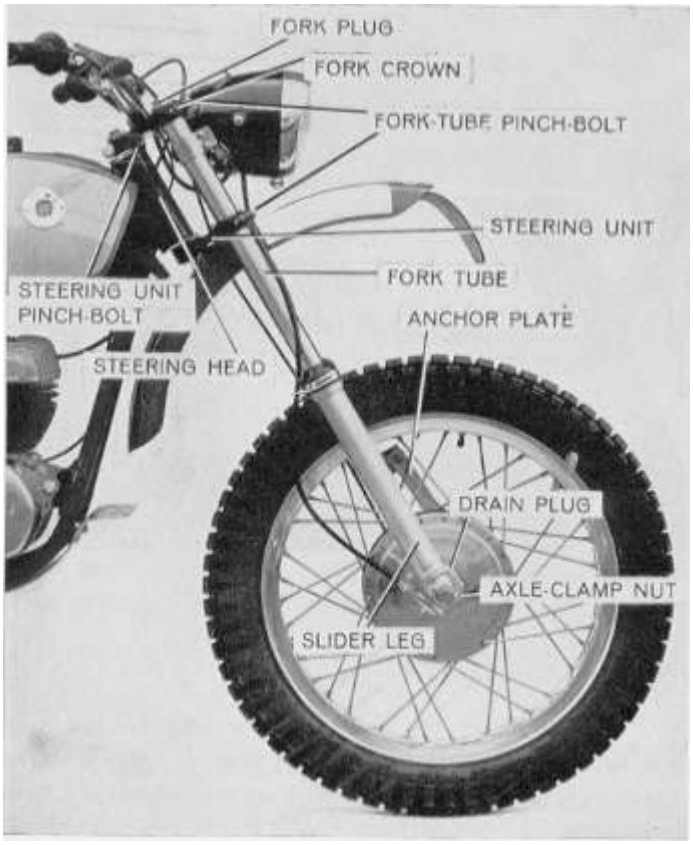
9. If everything else gives a good reading, check the two yellow wires at the pickup coil. You should get a reading of 18 ohms across the coil. If any the tests at the magneto backing plate give bad readings, install a new backing plate.



10. If everything gives good readings and the carburetion is correct, check for intermittent short circuits in the wires, or broken wires, or wires loose in their terminals in the electrical junction blocks, or loose screws in the handlebar switch.

Chapter 1. CHANGING OIL

1. It is not necessary to disassemble the front forks in order to change the damping oil.



2 With a 10 mm wrench, loosen the two fork tube clamp bolts on the fork crown. With a 22 mm wrench, remove the fork plug from the top of a fork tube. For the Wildfire, use a 36 mm socket.

3. With a 12 mm wrench, loosen the drain plug just above the axle mount near the bottom of the slider leg in the same fork tube/sliderleg assembly. Unscrew the drain plug from its threads in the slider leg, but do not remove the drain plug from the slider

leg because the drain plug also connects the slider leg to the hydraulic tube in the fork tube. Allow most of the oil to drain out of the slider leg. Gently work the front forks up and down to expel the rest of the oil from the slider leg without losing the drain plug.

4. Tighten the drain plug.

5. Pour Full Bore SAE 20 or 30 Fork Oil, (SAE 20 is usually better) or hydraulic fluid, or motor oil into the top of the fork tube. For the Pioneer, Stiletto, and Plonker, use 250 cc. For the Wildfire, use 125 cc per. leg.

6. Prop up the motorcycle so that the front wheel clears the ground.
Install the fork plug in the top of the fork tube, and tighten it with a 22 mm wrench. Tighten the fork tube clamp bolt on the fork crown with a 14 mm wrench. Place the front wheel on the ground.

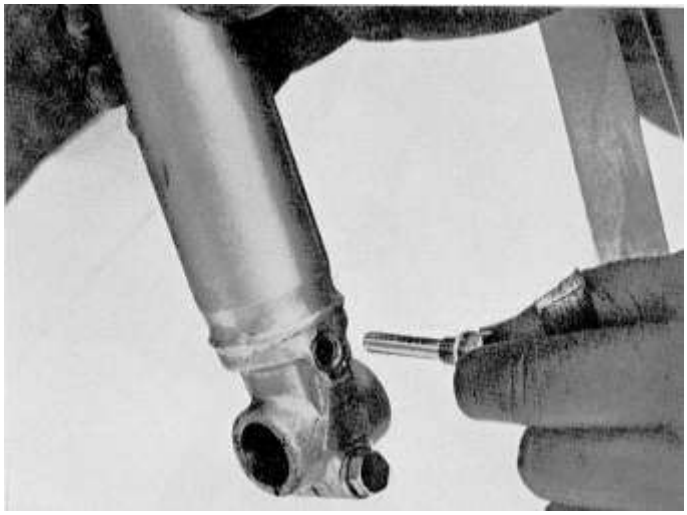
7. In the same manner, drain and fill the other fork tube/slider-leg assembly.

8. Be very careful if for any reason you find it necessary to remove the fork plugs from both fork tubes at the same time while the front wheel still attached, to the motorcycle. If you do not hold the second fork plug firmly while you remove it, it will escape with great force, bounce off the ceiling, and ricochet around the room.

Chapter 2. DISASSEMBLING THE FRONT FORKS

1. Prop up the motorcycle so that the front wheel clears the ground. With pliers, loosen the speedometer drive caplet. Unscrew the nut and remove the speedo drive cable from the speedo drive.

2. Push up the cap nut on the speedo drive cable. With pliers, remove the circlip from the cable. Pull the cap nut down off the cable. Pull the cable up out of the metal guide on the fork tube.

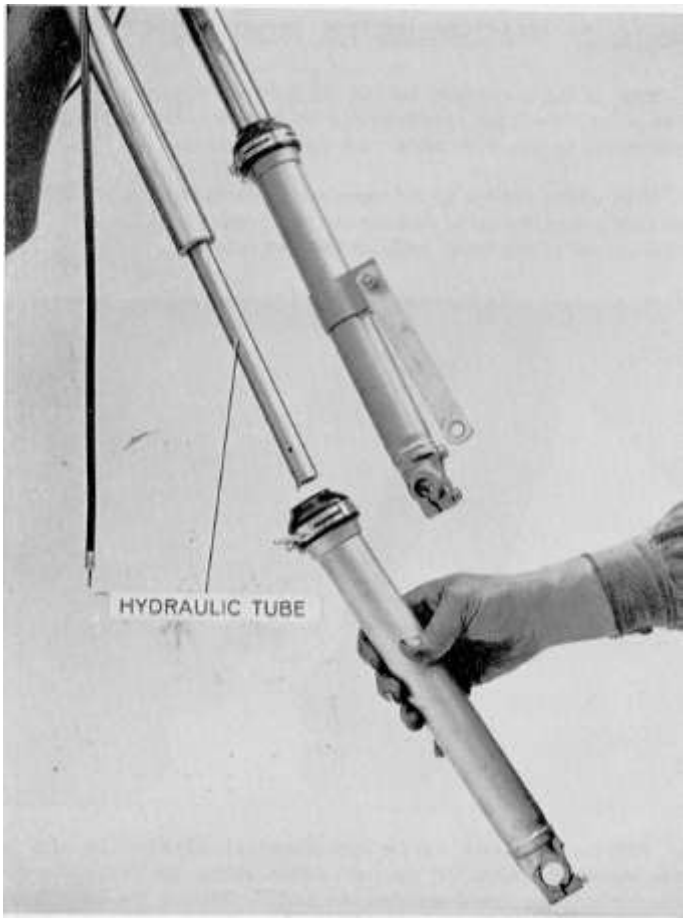


3. With the knurled nut, run the front brake cable adjustor tube intro the handlebar lever mount. On the front wheel, rotate the front brake arm counterclockwise (as if applying the brake). Remove the brake cable from the outer cable stop on the front wheel. Remove the lower brake cable fitting from the front brake arm.

4. With a 14 mm wrench, remove the bolt (and the lock washer) that mounts the brake anchor plate to the left side slider leg.

5. With a 23 mm wrench (it you don't have a 23 mm wrench, use the one in the motorcycle tool kit) remove the front axle nut. Remove the flat washer.

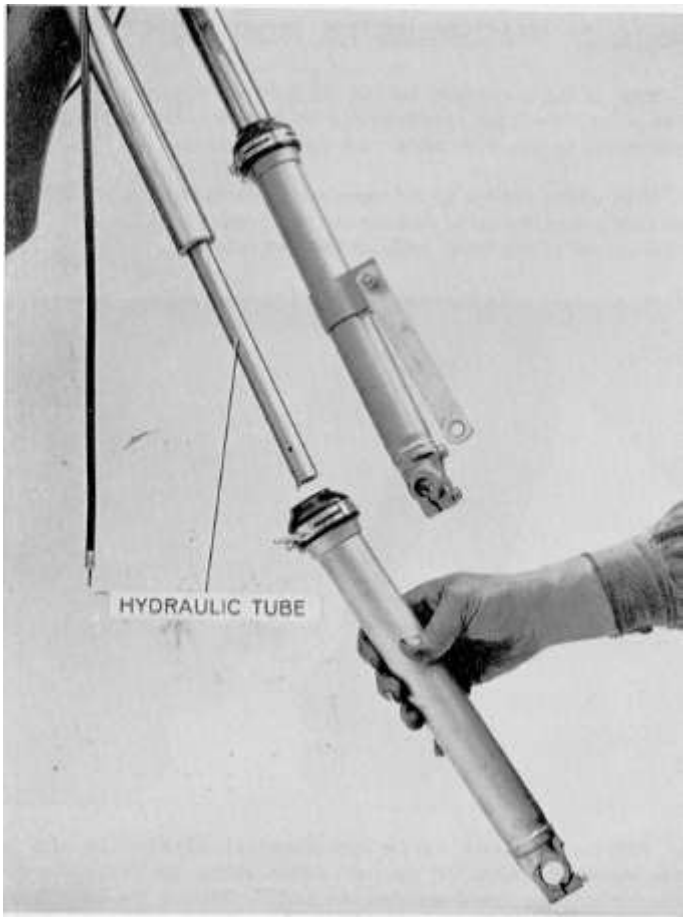
6. With a 12 mm wrench, loosen the axle clamp bolt in each slider leg, which is beneath the axle.



7. Fit a drift into the hole drilled near the right end of the axle. Pull out the front axle to the right, supporting the front wheel as you do so.
A thin spacer will fall out from between the left slider leg and the front wheel. The speedo drive unit and a dust cover will fall from between the right slider leg and the front wheel.

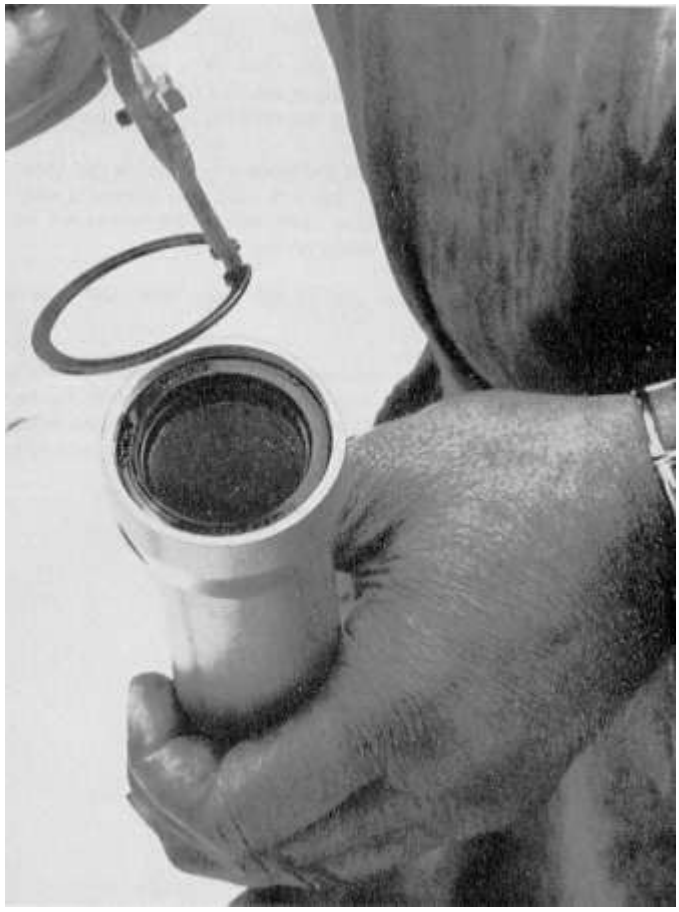
8. Remove the front wheel from the motorcycle.

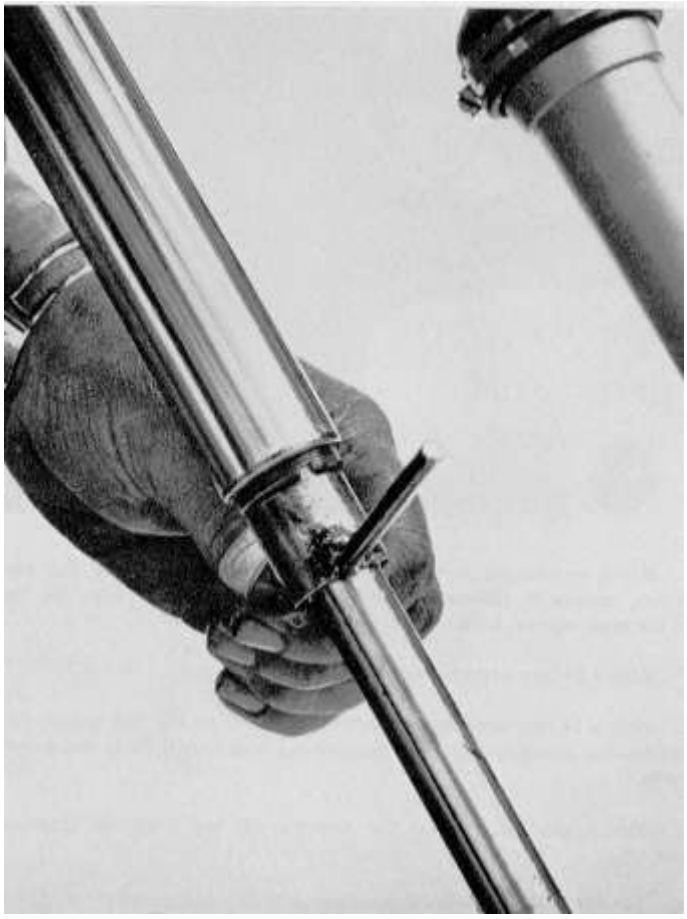
9. With a 12 mm wrench, remove the drain plug just above the axle mount. Note: the drain plug connects the slider leg to the hydraulic tube. Pull the slider leg down off the hydraulic tube and remove the slider leg from the motorcycle.



10. To remove the oil seal from the slider leg, use a screwdriver to loosen the rubber scrubber clamp screw. Remove the clamp from the rubber scrubber. Pull the scrubber up off the slide leg. Remove the 48 mm snap ring from the mouth of the slider leg with a pair of snap ring pliers. Pry out the old oil seal with a large screw-driver, being careful not to damage the babbit metal lining the inside of the slider leg.

11. To remove the hydraulic tube from the fork leg, first loosen the fork tube clamp bolt on the fork crow with a 14 mm wrench. Remove the fork plug from the top of the fork tube with a 22 mm wrench. Then lift out the fork spring.





12. At the bottom of the fork tube is a plug with two slots. With a homemade spanner or a pair of needle nose pliers, rotate the plug counterclockwise to unscrew it from the fork tube. Pull the hydraulic tube down out of the fork tube.

13. To disassemble the hydraulic tube, remove the plug and the spring from the tube.

14. Disassemble the other fork unit in the same manner. Disassembly of the fork units is complete. Proceed to chapter 5 for reassembly of the forks, unless you need to disassemble the steering.

Chapter 3. DISASSEMBLING THE STEERING

1. With an 8 mm wrench, remove the two nuts and bolts that mount each headlight-bracket to a fork tube.

2. With a 14 mm wrench, loosen the pinch bolt on the fork crown that clamps one of the fork tubes. On the steering unit, loosen the other pinch bolt that clamps the same fork tube. Hold the headlight bracket steady with one hand. With the other hand, pull the fork tube down out of the steering unit. Rotate the fork tube as you remove it from the steering unit.

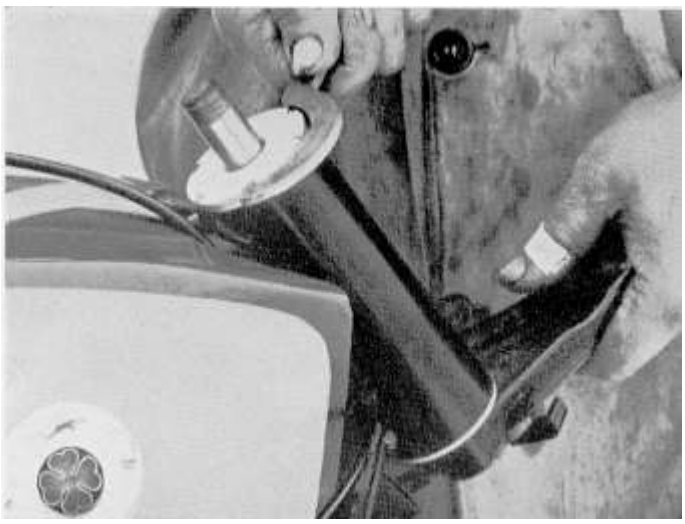
3. In the same manner, remove the other fork tube.

4. With a 10 mm wrench, remove the four front fender mount bolts from the bottom of the steering unit. Remove the front fender from the motorcycle.

5. With a 14 mm wrench, remove the four nuts from the handlebar U-bolts beneath the fork crown. Remove the U-bolts, and remove the handlebar from the fork crown.

6. If the motorcycle is fitted with a steering damper atop the fork crown, remove it. Otherwise, remove the rubber stopper from the top of the steering unit tube.

7 With a 27 mm wrench, remove the fork crown nut.



8. With a 14 mm wrench, loosen the pinch bolt on the fork crown that clamps the steering unit tube. Remove the fork crown from the motorcycle.

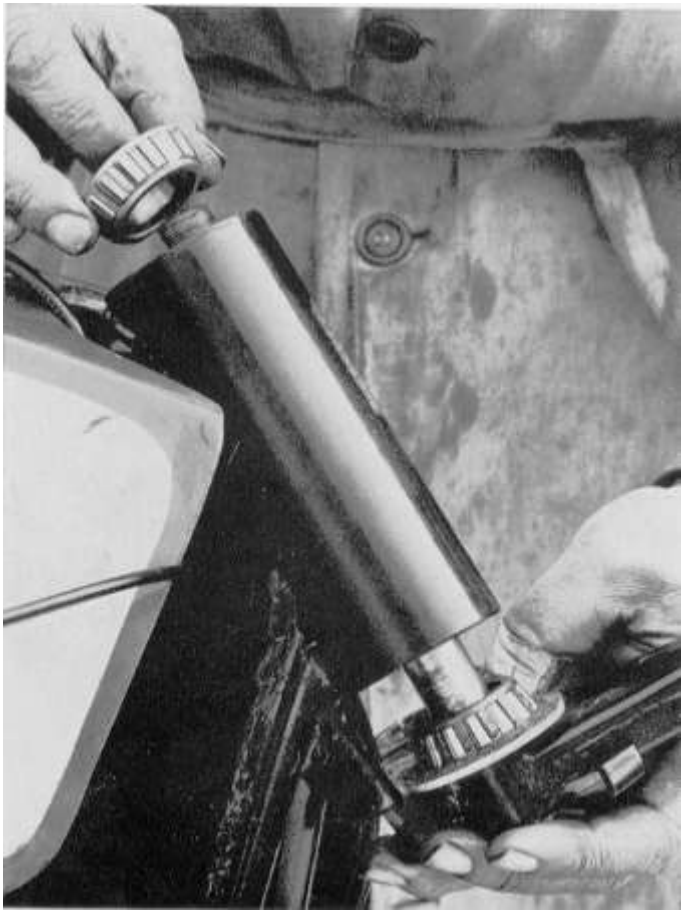
9. With a spanner, remove the steering unit nut from the steering unit tube.

10. Lift off the top bearing dust cover.

11. Pull the steering unit down out of the steering head. The inner race of the lower steering bearing will remain on the tube of the steering unit. The upper bearing will remain in the upper part of the steering head and can be lifted out. This completes the disassembly of the steering.

Chapter 4. REASSEMBLING THE STEERING

1. Remove the upper steering bearing from the steering head. Clean carefully, and grease both of the steering bearings.

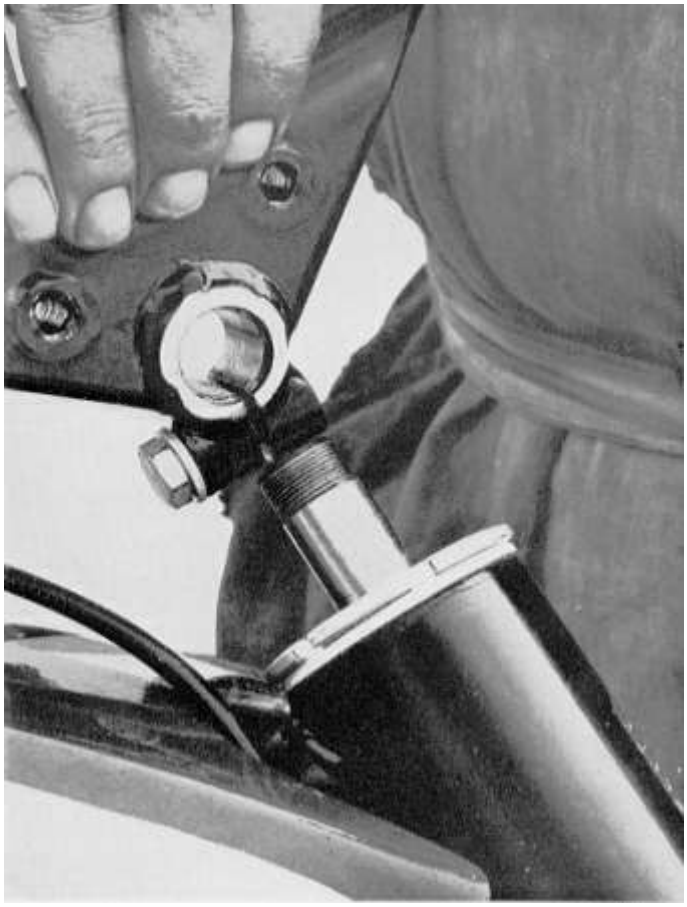


2. With the inner race and dust cover of the lower steering bearing mounted at the bottom of the steering tube on the steering unit, insert the steering unit into the steering head from below.

3. Fit the inner races of the upper steering bearing, with the small end facing down, to the top of the steering unit.

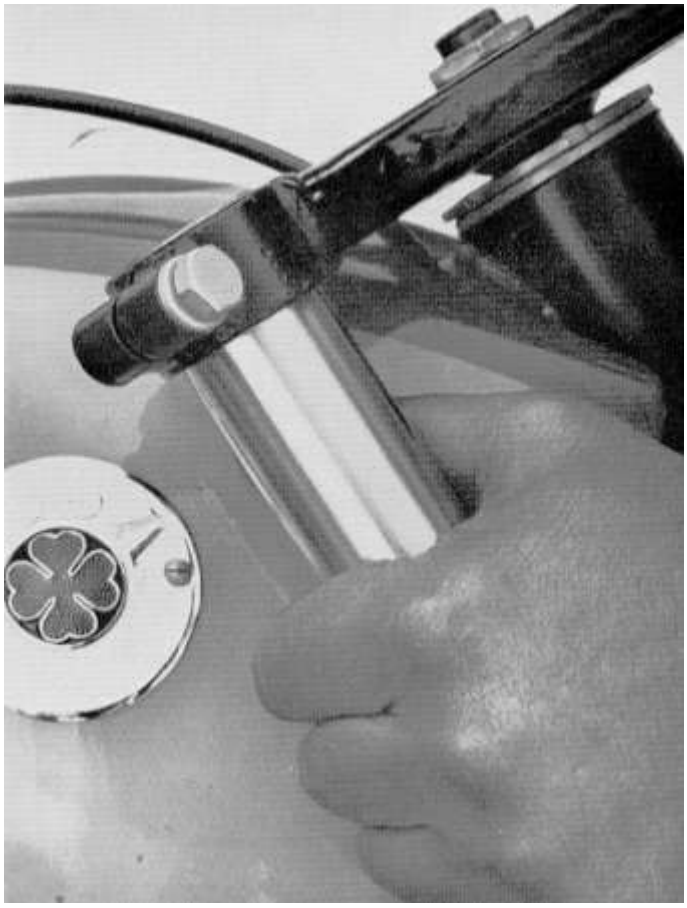
4. Fit the upper bearing dust cover, to the steering unit, with the felt facing down.

5. Attach the steering unit nut to the steering unit, and tighten the nut until you find it difficult to rotate the bottom of the steering unit. Now loosen the nut until you get the tiniest amount of play when you grab the middle of the bottom of the steering unit and work it back and forth toward the front down tubes of the frame. This will be about 1/4 turn of the nut. At this point, when you center the steering unit, it will probably not rotate to one stop or the other ofits own weight when you release it. Note: relatively new felt dust guards make the steering seem tighter than it really is.



6. On the fork crown, one end of the steering unit boss is chamfered. Fit the fork crown, chamfered side first, to the steering unit.

7. Mount the fork crown nut to the steering unit, and run it down until it is finger tight.

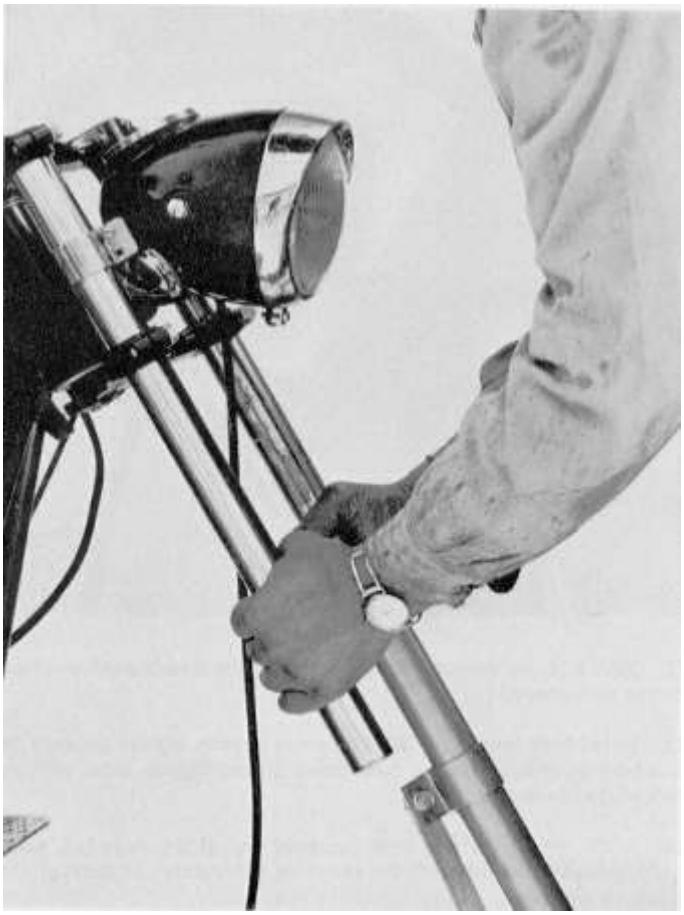


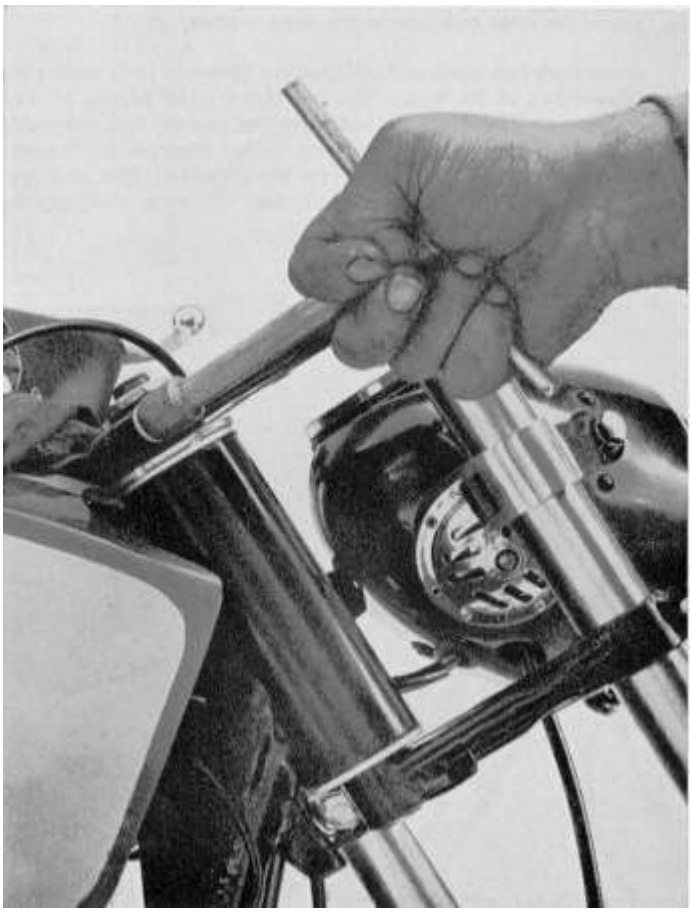
8. Work the top of a fork tube up into the fork tube boss in the steering Unit. Fit the headlight bracket to the fork tube, and continue to work the fork tube upward until the top edge of the fork tube is level with the top of the fork crown.

9. With a 14 mm wrench, tighten the fork tube pinch bolt on the steering unit.

10. Install the other fork tube in the same manner.

11. Grasp both fork tubes and wiggle them back and forth toward the front down tubes of the frame. You will feel a small amount of play. With a 27 mm socket, loosen the fork crown nut slightly. With a spanner, tighten the steering unit nut until there is no play when you try to wiggle the fork tubes back and forth. Tighten the fork crown nut. Now, when you center the front forks and release them, they will move easily against one of the stops, of their own accord.





12. With a 14 mm wrench, tighten securely the steering unit pinch bolt on the fork crown.

13. Install both fork plugs. With a 14 mm wrench, tighten securely the fork tube pinch bolts on the fork crown (never tighten them with the fork plugs removed).

14. NOTE: Whenever you have loosened any of the front fork pinch bolts, always tighten them in the sequence given above, to avoid placing strain on the forks.

15. Fit the front fender to the bottom of the steering unit. Fit a flat washer and a lock washer o each of the four front fender mount bolts, and mount the front fender. Tighten the bolts with a 10 mm wrench.

16. Fit the twistgrip to the handlebar. Position the handlebar on the fork crown. Fit the two U-bolts, with their curved brackets, to the handlebar and down through the fork crown. Fit a flat washer, a lock washer, and a nut to the bottom of each U-bolt leg. Tighten the nuts with a 10 mm wrench.

17. Position the twist grip on the handlebar, and tighten the mounting screws with a screwdriver.

18. Fit the electrical switch box to the left side of the handlebar. Position the cover on the switch box, and mount the clamp. Tighten the clamp screw with a screwdriver.

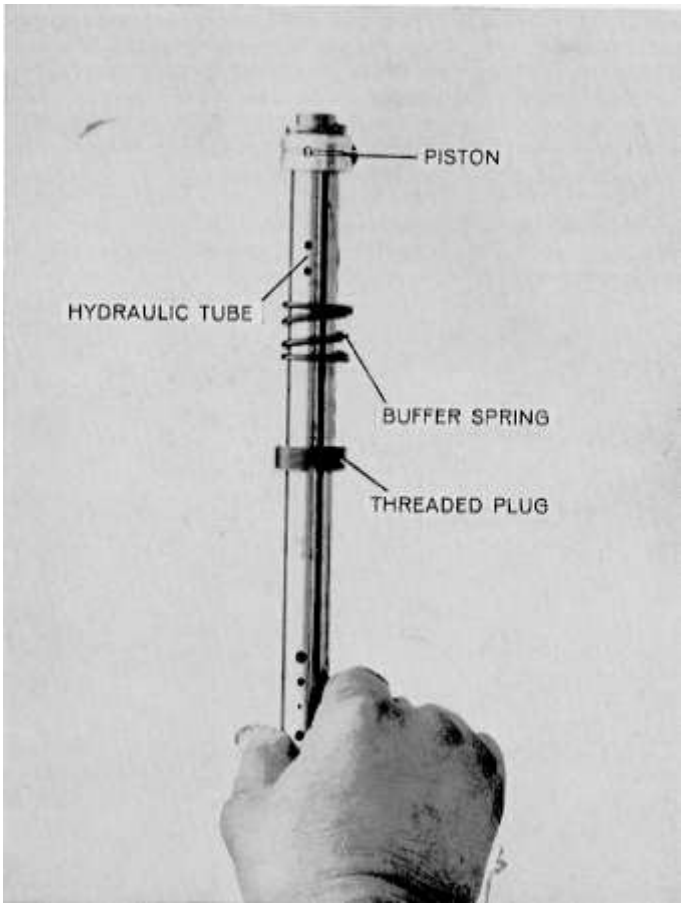
19. Insert the two nuts and bolts, with two washers to each bolt, that mount the headlight bracket to a fork leg. Tighten the nuts with an 8 mm wrench. In the same manner, mount the other headlight bracket.

Chapter 5. REASSEMBLING THE FRONT FORKS

1. If the piston on the hydraulic tube was worn, discard the hydraulic tube and use a new one.

2. Fit the buffer spring to the plain end of the hydraulic tube.

3. Fit the threaded plug to the plain end of the hydraulic tube, with the two slots in the end of the plug facing away from the tube.



4. Insert the hydraulic tube into the bottom of the fork tube, piston end first. Screw the threaded plug into the bottom of the fork tube, and tighten the plug with a spanner or needle nose pliers.

5. In the same manner, insert the other hydraulic tube into the other fork tube.

6. If you have removed the oil seal from a slider leg, position a new seal atop the mouth of the slider leg. Select a length of pipe approximately the same diameter as the seal, and use the pipe (as a driver) and a mallet to bottom the seal against its flange in the slider leg.

7. With a pair of snap ring pliers, fit the snap ring to its groove atop the seal in the mouth of the slider leg.

8. Fit the rubber scrubber, small end first, to the bottom of the fork tube.

9. Fit the rubber scrubber mounting clamp to the slider leg.

10. Rotate the hydraulic tube so that the mounting holes in the bottom of the tube will be aligned with the mounting hole in the slider leg, which is just above the axle clamp. Fit the slider leg to the hydraulic tube and the fork tube.

11. Install the drain plug, fitted with its steel and aluminum washers, in the slider leg and the hydraulic tube. Tighten the drain plug with a 12 mm wrench.

12. Pull down the rubber scrubber so that the bottom end is positioned on the mouth of the slider leg. Fit the clamp to the bottom portion of the rubber scrubber on the slider leg. Tighten the clamp screw.

13. In the same manner, mount the other slider leg.

14. With a 14 mm wrench, loosen the fork tube clamp bolts on the fork crown. Remove the fork plug from the top of one of the fork tubes. Pour in the damping oil (for quantities, see Chapter 1, Step 5 of Part D).

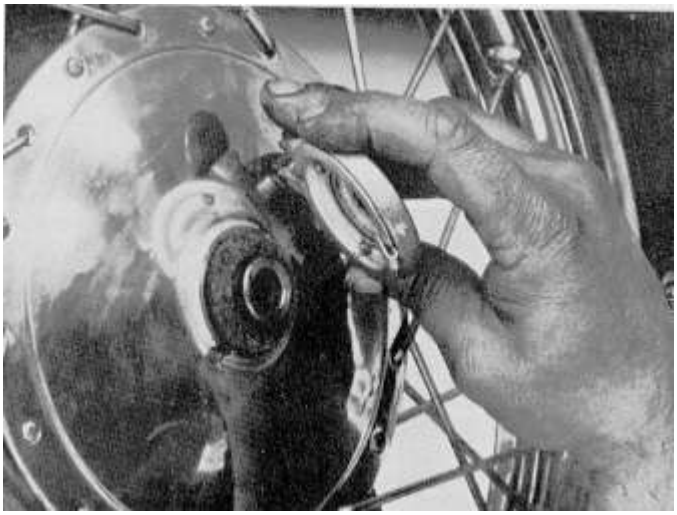
15. Insert the fork spring.

16. Install the fork plug in the top of the fork tube, and tighten the plug securely with a 22 mm wrench.

17. In the same manner, install the damping oil and the fork spring in the other fork tube. With a 14 mm wrench, tighten the fork tube clamp bolts on the fork crown.

18. Position the front wheel in front of the forks, with the brake drum facing left. Fit the front brake backing plate to the front wheel, and rotate the backing plate so that the anchor plate will be aligned with the mounting hole on the left side slider leg.

19. Clean the front axle very carefully so that there is no dirt or trash on it. Smear the axle lightly with clean grease. Lay the axle aside so that it cannot get dirty. These steps are very important, for the axle fits the inner races of the wheel bearings very closely. If you insert the axle when it is dirty, the axle will become scored, and it will be difficult to remove and install in the future.



20. Fit the felt pad and tab plate to the speedometer drive unit, and fit them to the right side of the front hub. Fit the tabs to the slots in the hub, and make certain that the tabs stay in the slots in the hub as you install the front wheel.

21. Fit the front wheel to the front forks. Insert the front axle, from the right, through the right slider leg, the speedometer drive unit, and the wheel.

22. Position the wheel spacer (it is slightly thicker than the washer for the front axle) between the backing plate and the left slider leg. Push the front axle through its mount in the left slider leg. Mount the flat washer and the front axle nut. Run the axle nut down finger tight.

23. Install the nut and bolt that mount the anchor plate to the slider leg. Run the nut down finger tight.

24. With a 23 mm wrench, tighten the front axle nut securely.

25. Place the motorcycle with the front wheel on the ground. Work the forks up and down. With a 12 mm wrench, tighten the axle clamp bolt beneath the axle mount on each slider leg.

26. With a 14 mm wrench, tighten the anchor-plate mounting bolt.

27. Mount the front brake cable to the brake arm. Press the brake arm upward, and fit the cable to the outer cable stop on the backing plate. At the handlebar lever, rotate the knurled wheel to extend the cable adjuster from its mount and obtain the correct handlebar lever travel. If you have extended the adjuster all the way, and the handlebar lever still too much travel, remove the brake arm from its splined shaft, rotate it one spline counterclockwise, and fit it to its shaft again. Then, proceed to re-adjust the knurled handlebar adjuster.

28. Fit the cap nut to the speedometer drive cable. Install the circlip in the cable. Screw the cap nut to the speedometer drive unit, and tighten the nut with pliers.