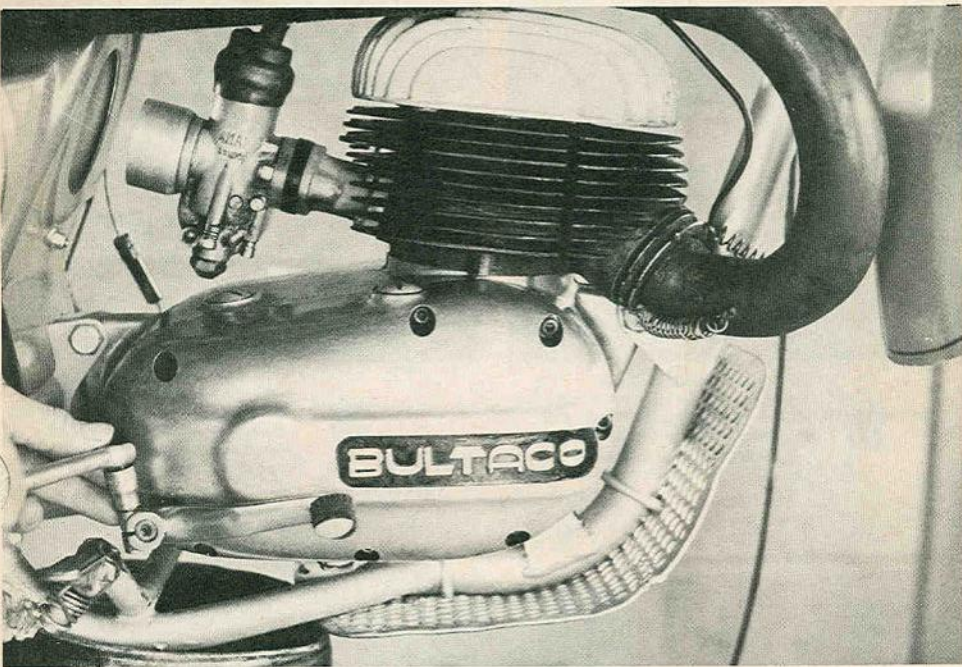


BULTACO OVERHAUL

An invaluable how-to for owners of the Big "B" from Spain By John Larsen



Disassembly of the Bultaco engine is simple. Removal of the right and left side crankcase cover is the first step. A 5mm Allen Wrench removes the case cover screws.

Straightforward is a good description of the engines from Bultaco. Since the average cycle rider usually ends up being a part-time mechanic, this can be important. If you are the sort of rider who likes to do his own repair or appreciates knowing what's going on inside his engine, you will be able to put this tear-down information to good use.

What Bultaco has done with its well-known two-stroke power plant is to manufacture an efficient, well-engineered engine that is still basically simple in design. What this means to you is that the engine is easy to maintain and easy to overhaul, particularly so when you compare it to the multi-cylinder models.

To get into the actual business of the overhaul, we have selected the Bultaco 5-speed Pursang as the 5-speed type of engine that now powers all of Bultaco's 250cc models.

Let's get into it by removing the left side of the engine first. This is the side which has the flywheel and ignition parts; if your problem were timing, you

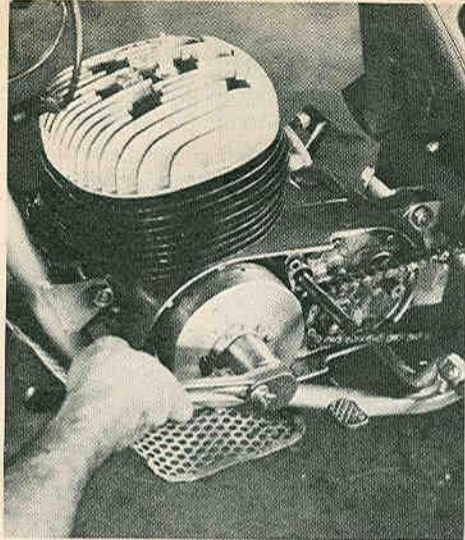
would want to start here. The kick-start lever is the first thing to go and is held on by a single pinch bolt. Remove this and slip the lever off. The cover itself is held in place by four Allen screws; remove these with the 5mm Allen wrench. Leave the cover attached to the clutch cable unless you intend to replace the cable, as the cable is long enough to allow the cover to be set aside, out of the way.

Now you have the flywheel and the sprocket side of the engine exposed. Before we can continue it will be necessary to remove the flywheel, so let's note a word of caution. Notice that on most all magneto ignition cycles the flywheel is threaded on the inside of the area that surrounds the nut holding the flywheel in place. This means that there is a special flywheel puller to do the job. Do not try to pry the flywheel off, or do not use the "claw" style puller, as the first thing you may succeed in doing is breaking the flywheel.

Rather than make yourself a new problem, first put the cycle into highest

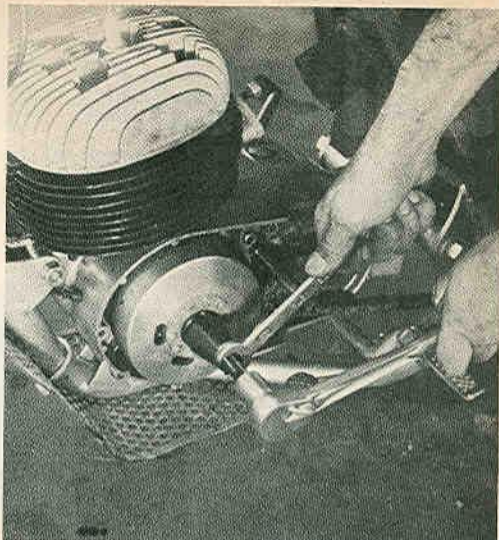
gear (in this case fifth gear), and then put on the rear wheel brake. Now begin to remove the flywheel nut, and when you have as much tension as possible against the nut, take a hammer and strike the handle of your wrench a sharp blow; this should break the nut loose. There are several good tools available to hold the flywheel for this job, and if you have them, by all means use them. The reason we mention the rear brake method is that we realize that very few of these tools are found outside of a cycle shop.

Now that the nut is off, remove the washer and lock washer behind the nut and insert the puller. Make sure that the inner screw of the puller is backed off all the way and then thread it firmly into place. Accept no substitute for the proper puller. If you don't have one, you can



2

To permit splitting of the crankcases, the magneto must be removed. Holding the right side flywheel or placing engine in top gear with rear brake applied permits magneto nut removal.

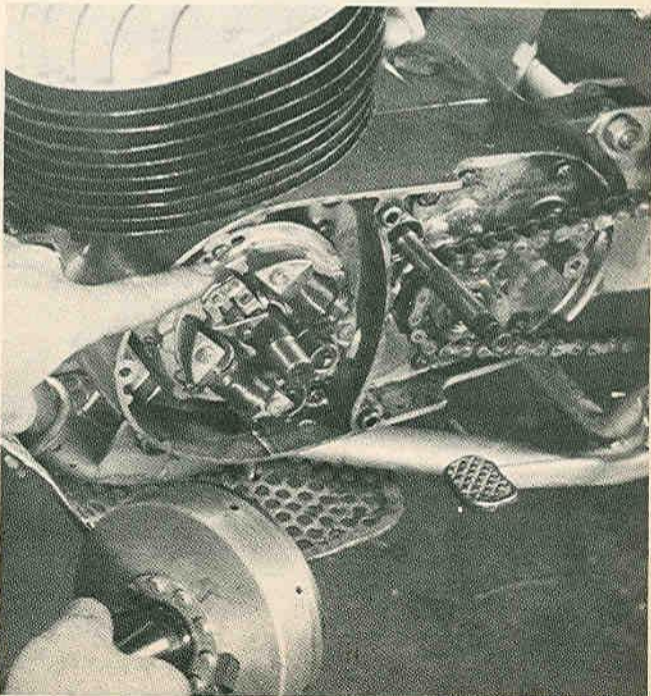


3

One special tool is used to remove the magneto flywheel from the crankshaft. Be sure the tool body is screwed into the flywheel completely before tightening breaker bolt.

4

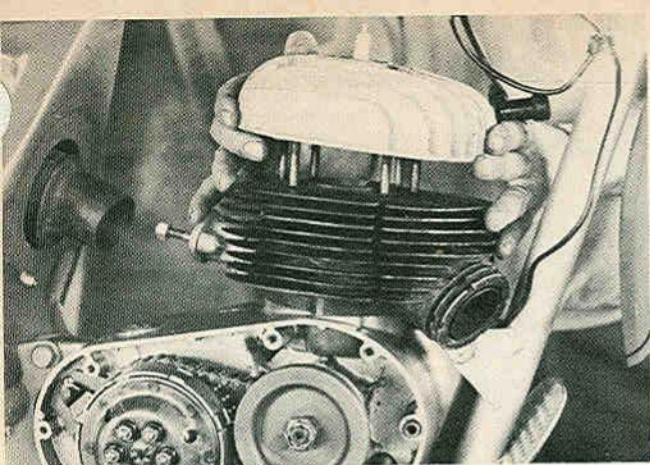
Before the breaker plate is removed a line should be scribed on the plate and the crankcase. This will ease ignition timing when reassembling.



purchase one from the dealer or he can remove the flywheel for you — the job is quick and simple. One final word on flywheels. Do not hit them with the hammer to try to knock them loose. You can knock the magnetism out and render the magneto useless.

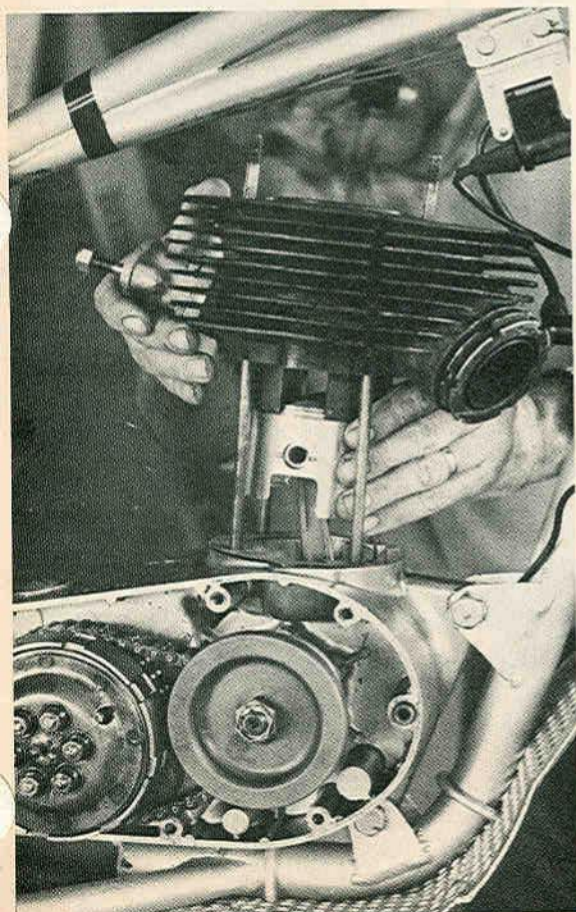
With the flywheel off, you can now see the coils of the ignition system. They are attached to the mounting plate, which is held to the engine with three brass screws. Before removing the screws, take a small chisel, or sharp awl, and make a small mark across the mounting plate so that there is a similar mark on

Continued on page 80



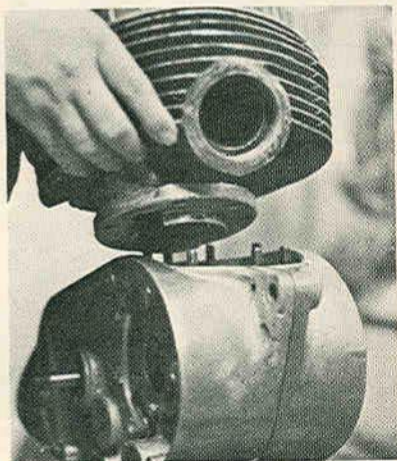
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Removal of the six 14mm nuts allows the head and cylinder to be taken off. Four of the head nut studs go through to the crankcase and two are integral with the cylinder.



6

Before pulling the cylinder off the piston, place a clean rag in the crankcase opening. This will prevent any broken rings or foreign particles from dropping into the crank assembly.

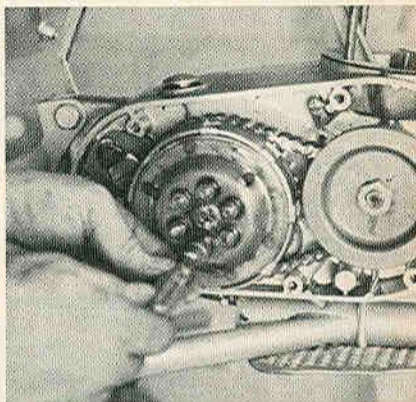


7

The 200cc and four-speed models have seven nuts from the crankcase holding the cylinder on rather than through studs from the cases to the head.

8

Taking the piston off is accomplished by removing the wrist pin retaining clips and pushing out the wrist pin. If the wrist pin can't be pushed out, heat the piston slightly with a torch. Do not pound out the pin.

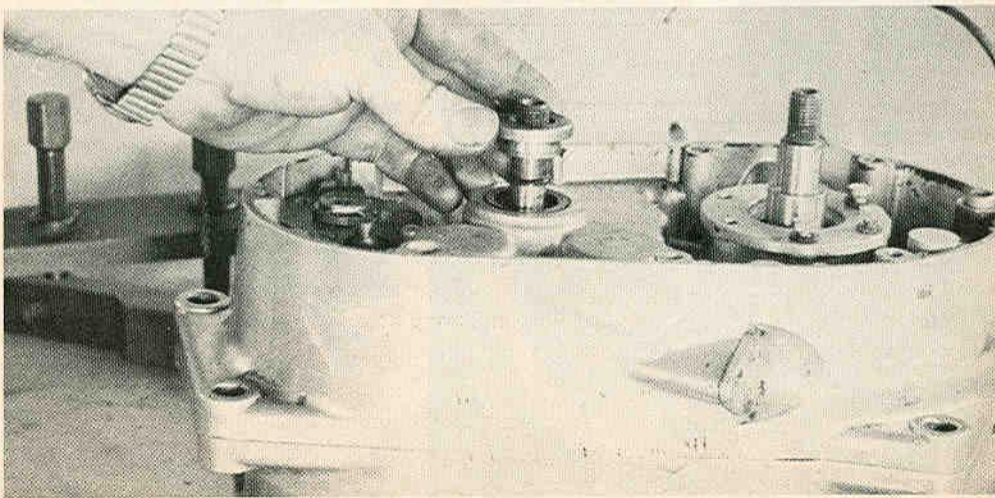


9

To take off the clutch and right side flywheel, the clutch springs and crankshaft nut must be removed. The clutch, flywheel and primary chain then come off as a unit.

10

Remove the collars and spacers from the transmission mainshaft and crankshaft and set them aside. The 4-speed and 200cc models have a collar on the clutch shaft only.



BULTACO OVERHAUL...

Continued

the case of the engine. If the engine lacks such a mark, this will come in handy when you re-assemble the engine. Remove the three screws and unplug the black and yellow wires from the small block located below the mounting plate. The later models have a third ground wire that will require removing one of the 10mm headed nuts.

The round plate which surrounds the crankshaft under the mounting plate is the engine seal retainer. This is held in place by six 10mm headed screws. It is

not necessary to remove the retainer to split the cases, but this is an excellent time to replace the seals.

The cylinder and the cylinder head are held in place by four long bolts that run from the cases up through the cylinder head. This is true for all Bultaco engines of 250cc or more. The Pursang and Mk II and Mk III Matador have two additional short head bolts which complete the six bolts found on the cylinder head.

Remove all of the nuts from the bolts, and the head, cylinder, and head bolts will slip off. On the 250cc four-speed engines, you will find three more short bolts holding the base of the cylinder on;

these also must be removed. If your engine is a 100cc to 200cc four-speed, seven short bolts hold the cylinder to the cases.

Now the piston can be seen, as well as the connecting rod assembly. If you do not intend to split the engine cases, immediately stuff a clean rag into the area below the piston to insure against dirt or grit getting into the crank area. Now remove the piston by first taking the two wire wrist-pin retainers out of the sides of the piston. The cases can be split by leaving the piston in place, but it is not a good idea because the piston can be marred or damaged by accident when you are working on the cases. If the wrist-pin does not push out, heat the piston with a butane torch, and this should free the pin.

Next, let's go to the other side of the engine and prepare to remove the primary drive cover by taking off the shift lever. You will want a fairly large pan under this side of the engine, as approximately 50cc of primary oil will remain in the area after it has been drained. Use a 5mm Allen wrench to take the seven screws out of the cover. When they are out, bump the cover with the heel of your hand, or a soft-headed hammer, to jar it loose.

With the cover out of the way, next remove the lock nut from the drive end of the crankshaft by holding the large nut with one wrench and backing off the lock nut with another. You may remove the large nut with the rear brake method mentioned earlier.

Before the primary drive sprocket and chain can be removed, the clutch itself must be dismantled, as the chain has no master link. The clutch is held together by six 11mm head size nuts and these are all held in adjustment by a lockwire. Remove the lockwire and keep it in one piece so you can easily cut a new one the same length when it is time to re-assemble the engine. Take the six nuts off, and the clutch plates will be free for removal. Take the clutch plates out, and be sure to stack them in the same order as you removed them. This is a good idea on any make of cycle, as the plates will have worn in to mate each other.

Now you are ready to remove the third essential nut which holds the clutch hub in place. Both the primary drive sprocket and the clutch hub will fit their shafts snugly, and they may be pried loose. Do not, however, pry against the engine gasket area, as you may damage the mating surface and cause future oil leak.

When the primary drive assembly is off, you have only to remove the bushings or collars that fit behind the sprocket and clutch. Slip these off and you will notice that each shaft has an "O" ring behind the collars. Remove these and the shift mechanism, and you are through in this department.

Continued next month
CYCLE GUIDE

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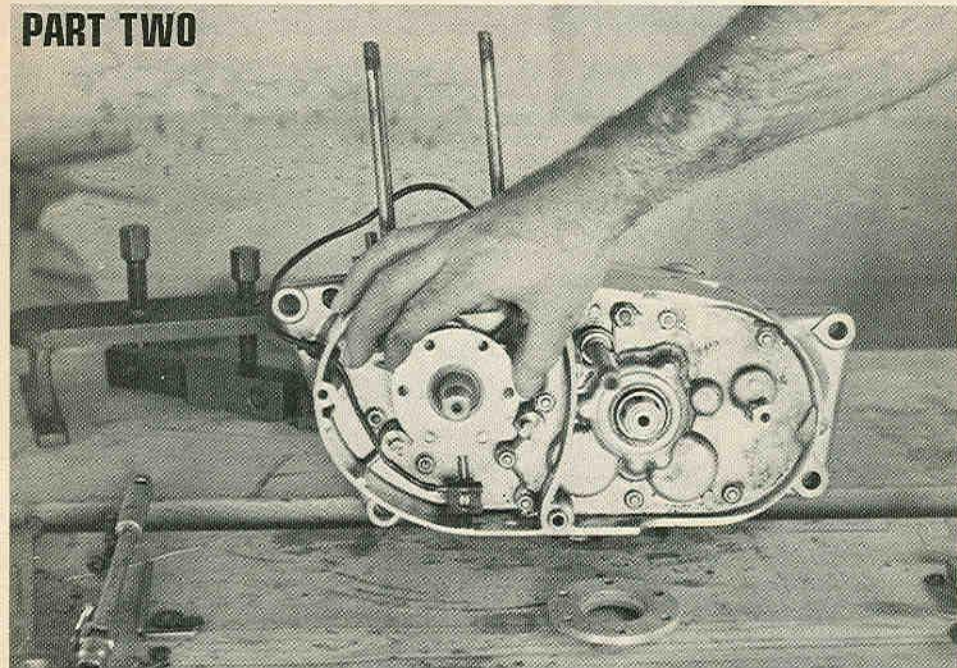
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By John Larsen

PART TWO



The only thing that has yet to be done before the cases are tackled is to remove the twelve 10mm headed nuts from the right side of the engine. Don't forget the additional Allen screw that is located behind the front upper motor mount. You can leave the sprocket on unless you want to eventually remove fifth gear from the cases.

You are ready to go on the five-speed engine. The four-speed model may have a speedometer drive gear which is located under the engine and held in place by a triangular plate. This will have to be removed and the drive gear pulled out. It will also be necessary to remove the brass sleeve that houses the drive gear. This is done by first removing the lock screw and then reaching inside with a tool (a heavy spoke will do) and sliding the brass sleeve out about an inch. Now let's split the cases.

The best way to do this is to use Bultaco's tool which is designed for this purpose. The puller screws on to the

primary side of the engine with four case screws, and the tightening of the bolts on the puller has the cases apart cleanly in a matter of minutes. *Note:* If at any time the cases do not want to part easily, you have overlooked something, probably a nut or that Allen screw by the engine mount.

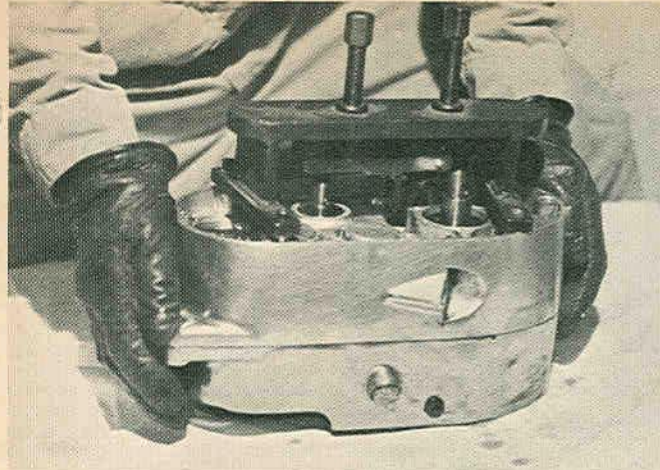
In all cases when splitting the engine, it is best to first heat the engine on a hotplate or oven to 300 degrees to avoid the bearings scraping metal out of their seats and then in the future spinning in the cases.

What if you or your dealer lack a tool such as the one mentioned above? We have told you the best way to do the job, so we'll inform you of the worst — so you won't be tempted. The worst is to start wedging between the case halves with screwdrivers or other tools. It can be done this way, but unless you happen to be a gentle expert, you run the risk of ruining the cases. Let's do it by the following method.

11 Take out the twelve 10mm screws and one Allen screw from the seal retainers and remove them. If a speedo cable is attached, remove it from the bottom of the case.

First remove the seal retainer and check the keyway of the clutch driveshaft to be sure it is free of any burrs. Then heat the cases. Using gloves, hold on to the primary side of the heated cases and tap on the ends of the clutch driveshaft and the end of the crankshaft with a rawhide mallet or soft-headed ax to part the cases. Never hit the end of any of the shafts with a steel-headed hammer, or you will ruin the threads and the shaft. Hold the case half so that the lower half of the case can fall free.

Now as you part the cases, you will note a feature that has made the Bultaco engine a favorite among many mechanics. The engine does not, we repeat, does



12

Heat the cases to 300° in an oven and attach the crankcase puller. If a puller is not available, tap the shaft ends with a rubber mallet while holding one case half in the air after the cases have been heated.

13

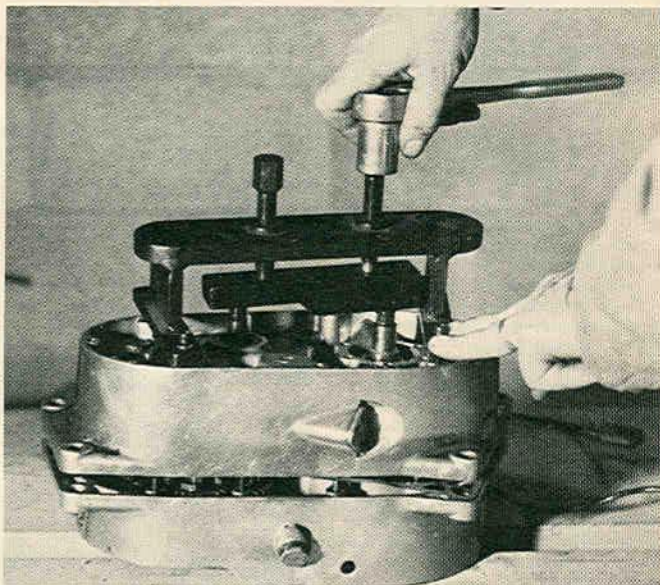
Using a crankcase puller is the easiest and safest method of splitting the case halves. Keep the clutch side up to keep all internal parts in place when case halves split.

not, explode into a hatful of pieces, but rather, if you have followed the preceding steps carefully, you will find that all of the gears and the parts remain in place and are very straightforward. Just carefully observe what relation the parts are in and put them back the same way, and you can't go wrong.

On the five-speed model, the only washer or spacer to be found will be the spacer that fits between the gear and the case on the kick-start shaft on some models. On the four-speed bikes, the lay shaft may have the following spacer set-ups depending on the year and type: For example, if the lay shaft is a solid billet, no washers; if the lay shaft has only fourth gear attached to the lay shaft, there should be a spacer on the first gear end; if all the gears are separate and removable from the lay shaft, there should be a spacer on each end.

With the work done inside the engine, it will be time to go the other way. If you have removed the gears from the transmission, replace them and run them through the gear changes by turning the sprocket shaft. Make sure they all work correctly. If yours is the Lobito, Campera or Mk II Matador, one of the shift forks will have a cut-away area on the inside of the fork to allow the fork to clear fourth gear. Make sure this is in place, and it will save you a later teardown to do it over.

Before assembling the case halves on the five-speed, first remove the spring-loaded detent that meshes into the shift drum and also take out the pawl mechanism that turns the drum. The latter is held in place by three screws found on the outside on the primary drive side of the engine. This makes engine assembly much easier and avoids the chance of either of these assemblies being jarred out of place as you assemble the engine.



Next take a careful look at the mating surfaces of the engine and remove any dirt or pieces of gasket which may have stuck to either side. If there are any gouges or burrs, you may want to coat them with gasket seal cement before putting the gasket in place.

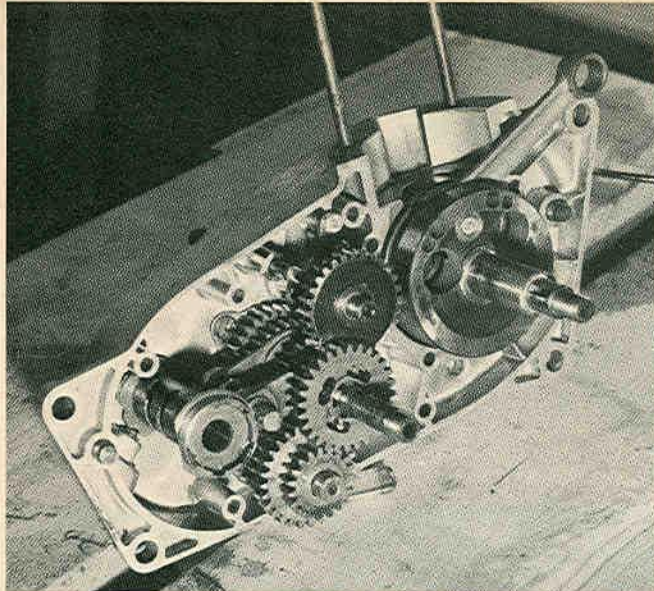
One last note is that we find it a good idea to replace any questionable seals, bearings, or "O" rings at this time, because now it will take only a minute to do so. It will save your opening the engine again if they fail at a later date. The neoprene seals should have a knife-like

edge on the innerside where they touch the shaft, and all ball or roller bearings should turn freely with no trace of binding or roughness. When in doubt, replace. Once a ball bearing gets rough, it won't last long.

We realize that the preceding information sounds logical and perhaps not worth the mentioning, but you would be surprised and shocked, if you're paying the bill, at how many professional-type mechanics do not take the time to do these things.

Now reheat the case half and start the

After the crankcase halves are separated, observe the assembly of the transmission upon removal. This will insure correct assembly of the trans.



wedge and check again until the crank runs true and smooth.

Now that you have the cases snugly back together, begin to tighten the twelve 10mm headed nuts and the Allen screw. Do not over-tighten these nuts, but rather grab the wrench as close to the beginning of the handle as possible, and tighten firmly in a cross sequence around the crank first. If you get out on the end of your wrench handle to tighten the nuts, you will get them too tight. The best way is to obtain an inch-pounds torque wrench and give these nuts 60 inch-pounds.

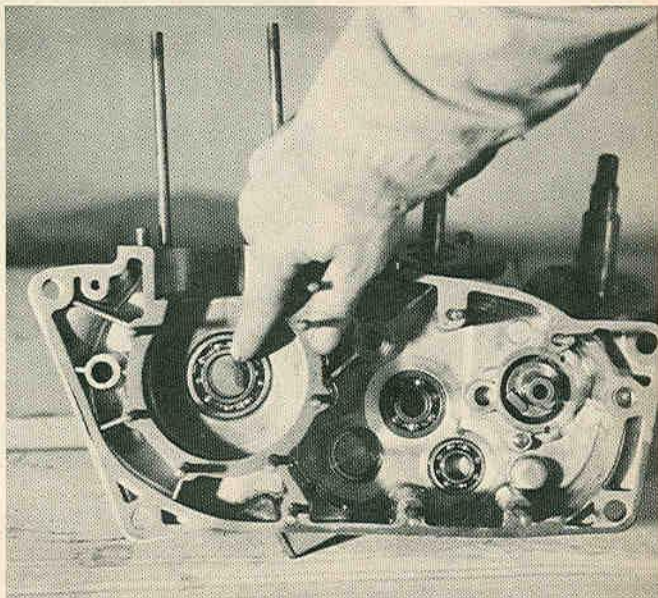
Now you can place the engine back into the frame and re-install the clutch and primary drive assembly. The clutch hub nut should have 75 foot-pounds of torque. Be sure to put the "O" rings back

case halves back together by inserting the ends of the clutch and crankshaft through the bearings of the case, and slide the cases together quickly. It is easier to heat only the free case half and by sliding them together rapidly you can probably get them together before the heat begins to equalize between the two.

The only place the case should hang up on re-assembly is where the crank meets the crank bearings. If necessary, you can tap the area that holds the main bearings with a hammer and a block of wood, or a plastic-headed hammer. Never pound on the cases with a steel hammer. Be sure the shift drum and the fork axle are in place, and the cases should come close enough together so you can finish the job by tightening the twelve bolts that hold the cases together.

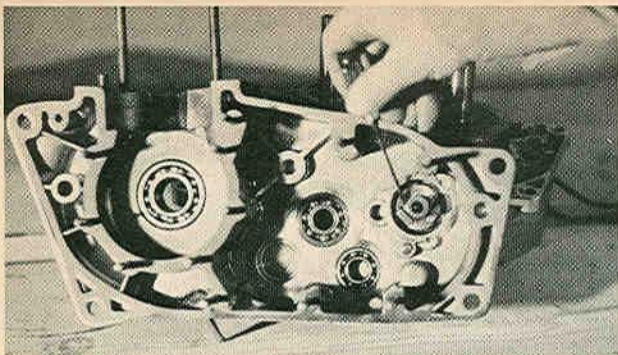
Note: If the cases require much tension at all to draw them together, you can be pretty sure that something is the matter. If you have any difficulty at all, stop and take the cases apart and have a look. The only place you should feel any resistance is where the crankshaft slips through the crank bearings.

This same rule will generally apply to any and all two-cycle engines that have cases that split vertically. One thing to watch for is the crank being pinched. This happens when the cases come together and they bind on the crank and try to force the heels of the crank flywheel together. Check by running the crank through and watching for run-out. Spread the crank by spreading the heels of the crank apart with a chisel or a



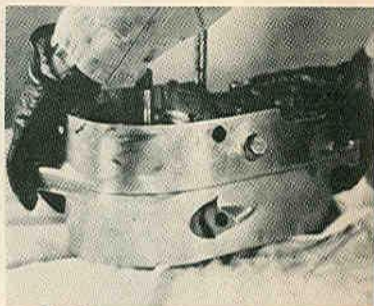
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Check all of the ball bearings for wear and replace any that are doubtful. Heating the case half around the bearing will allow the bearings to be removed and installed easily.



16

Removing the three screws that hold the shift mechanism in and taking out the shift detent out will facilitate ease of reassembly.



17

When placing the case halves back together, heating the upper case half will allow it to fall into place.

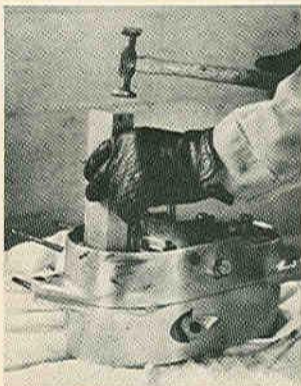
as this will cause clutch drag. Adjust the clutch nuts until the pressure plate runs smooth when you turn the engine.

Now you can lockwire the pressure plate and re-install the primary clutch cover. The primary side of the engine should be filled with 300cc of 10 SAE oil. Fill the gearbox with 600cc of 90 SAE weight. You will have to add more than the normal amount to both the gearbox and the primary side, as you will have drained out more than a normal amount of lubricant when the engine was dismantled. Be sure to tighten both drain plugs firmly in place.

We are at the place now where the final ignition timing will have to be checked. On the Pursang, the ignition points should break open when the piston is 3.8 and 4.1 mm before top dead center. The Matador points should open between 3.0 and 3.25. Use a Vernier gauge or dial indicator for this, and a timing light is necessary for accuracy. If you lack these tools, have your dealer set the timing for you. Timing is very critical. Poor performance and piston seizure can result from improper timing.

By now, you have only to re-install the spark plug, the flywheel cover and cinch the kick-start lever down — and you're ready to go.

That's the name of the engine game when you're working with BULTACO. ●



18

The only drag incurred when pushing the case halves together is when the crankshaft contacts the crank bearing. A few taps with a hammer and piece of wood should push the halves together.

borrow a torque wrench if you don't have one.

To install the ignition point plate, place it in its recess and rotate until the marks that you made line up. You can then tighten it down and back into alignment. Replace the flywheel after placing the key in the proper position. Re-check the timing and tighten it down to 75 foot-pounds torque. Since the opposite side of the engine still has its cover off, you can place a wrench on both nuts on each end of the crank and tighten both at the same time.

Now, replace the kick-start lever and kick the engine through while watching the clutch mechanism. Make sure the pressure plate on the clutch does not wobble when the clutch is disengaged.

on the proper shaft. Also on the duplex chain models, it will be easier to install the shift mechanism before you replace the clutch hub. For the clutch, adjust the springs by screwing the nuts in until the springs are compressed firmly, then back the nuts off three turns for the steel models or four turns for the neoprene-coated plates. Don't lockwire yet, as we are going to check the clutch when we kick the engine through.

To re-install the cylinder and piston, first stuff a rag in the cases to prevent any foreign objects from falling into the crank area. Place the piston pin through the piston far enough to hold one of the spacer washers and then make sure the needle bearing is in place on the upper end of the rod. Slide the piston pin through the connecting rod end. When the pin has cleared the edge of the needle bearing, slip the other spacer into place and finish pushing the pin through.

Before you give the pin its last push into place, insert the wire wrist-pin retainer and let the pin come up against it snugly. Never re-use these retainers, but insist on new parts. Place the other retainer in the opposite side of the piston and align the piston rings with the stop pins found in the ring grooves. Hold the piston rings in as you slip the cylinder down so they won't snag.

With the cylinder home, you can now install the cylinder head. The tightening sequence on the head is to tighten the four long bolts first and then tighten down the two short head bolts. Do this by considering the four long bolts as the corners of a square. With this in mind, tighten first one corner and then go to the opposite until you have done all four. Then go to the short bolt nearest the first long bolt you tightened and finish with the other short bolt. Tighten these down a little at a time and repeat the pattern until you have 12 foot-pounds of torque on the bolts. Never cinch any head bolts down hard without following the pattern, as you can easily distort the aluminum cylinder. This tightening is critical, so