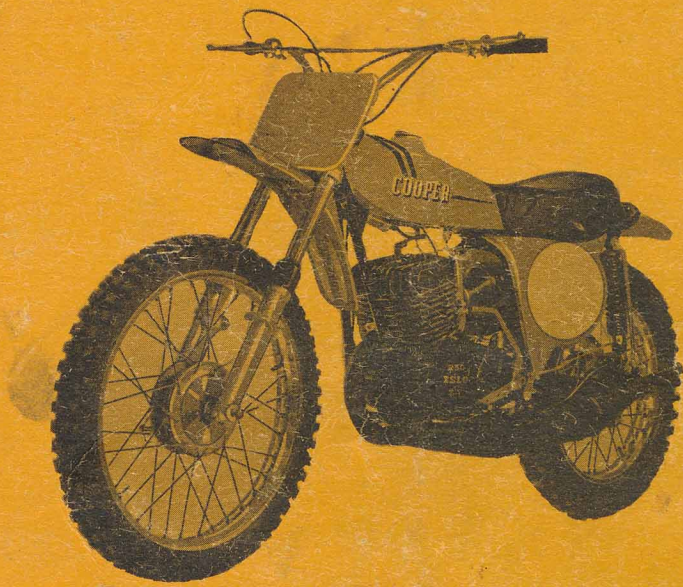
THE COOPER



SHOP MANUAL

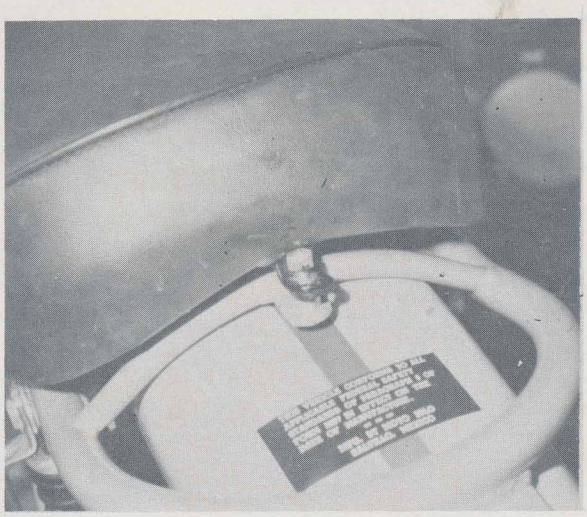
MX & ENDURO 250

FIVE SPEED

MANUFACTURED BY MOTO ISLO
SALTILLO, COAHUILA., MEXICO

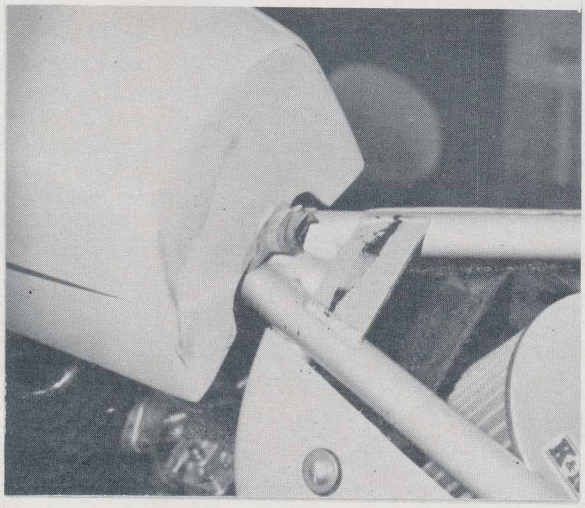
SPECIFICATIONS	250cc
ENGINE	SINGLE CYLINDER
BORE	70 mm
STROKE	64 mm
HORSEPOWER (SAE)	30 HP @ 7000 RPM (DYNAMOMETER)
COMPRESSION	10 : 1
CRANKSHAFT	4 LARGE MAIN BEARINGS
IGNITION	MAGNETO WITH 6 VOLT
TRANSMISSION	5 SPEED GEAR BOX WITH EVENLY SPACED GEARS
FRAME — STEEL	4130, CHOICE OF EUROPEAN RACING TEAMS
FRONT FORKS	BETOR 7" TRAVEL MOTO CROSS
REAR DAMPERS	BOGE MOTO CROSS WITH 70# SPRINGS
FRONT & REAR BRAKE	140 mm INTERNAL EXPANDING
FRONT TIRE	3.00 x 21 MOTO CROSS PATTERN
REAR TIRE	4.00 x 18 MOTO CROSS PATTERN
WHEELBASE	55½ (1400 mm)
WEIGHT (dry)	225 POUNDS (103 kg)
GASOLINE CAPACITY	2.5 GALLONS (U.S.A.)
REAR CHAIN	⅝" x ¼" REGINA MOTO CROSS CHAIN

REMOVING ENGINE FROM FRAME



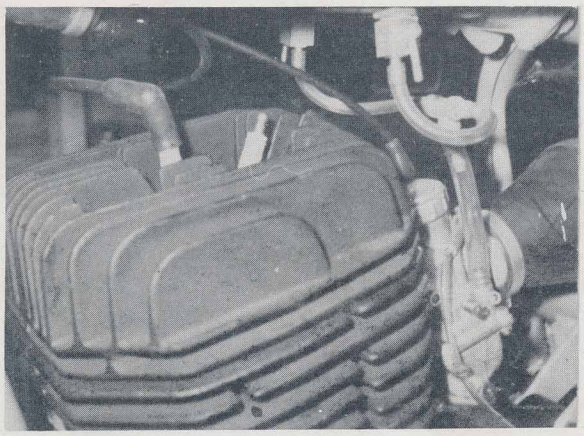
1

Remove the seat by removing the 5/16" or 11mm nut; lift the rear of the seat and pull backward.



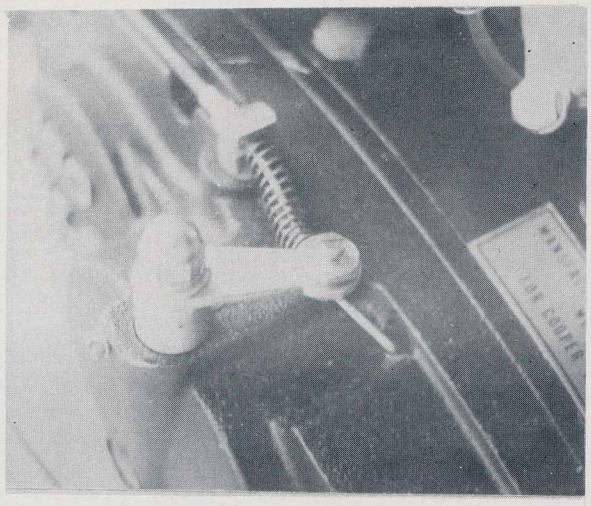
2

Unhook the rear tank mount rubber band.



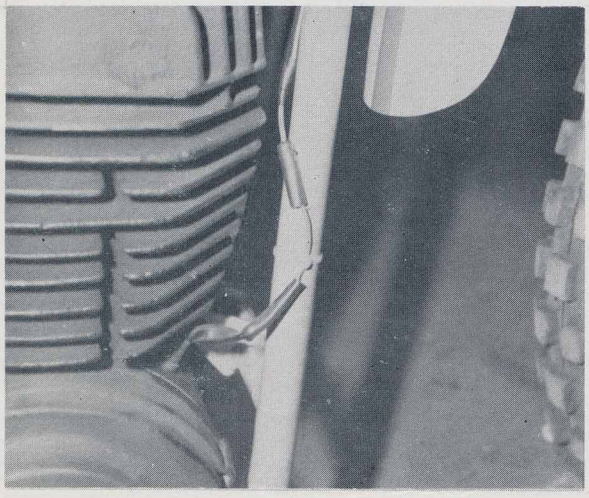
3

Remove the gas lines. Pick up the tank at the rear and pull it backward.



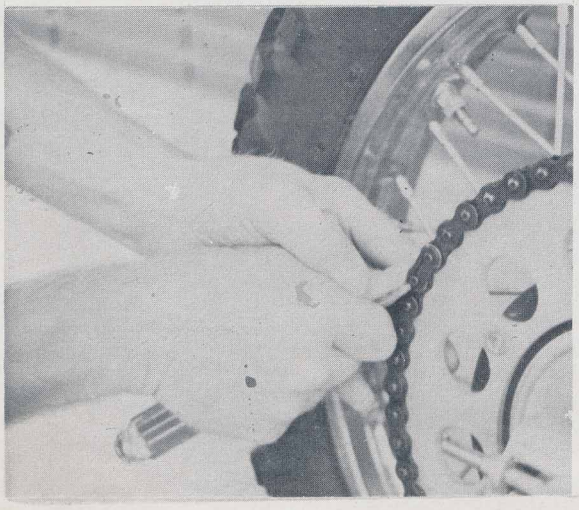
4

Remove clutch cable by loosening the screw in the cable clamp and sliding the cable out.



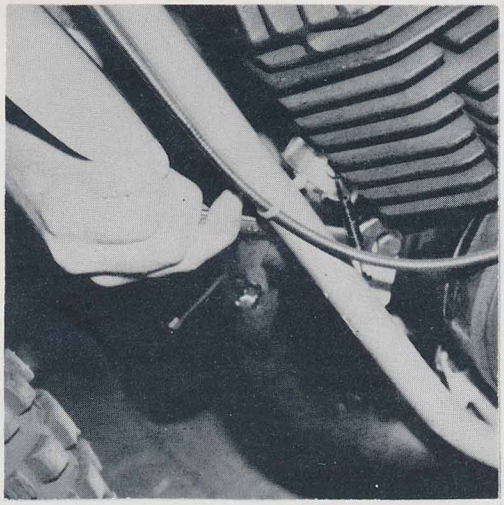
5

Unhook ignition wire. The wire runs along the right hand front frame tube.



6

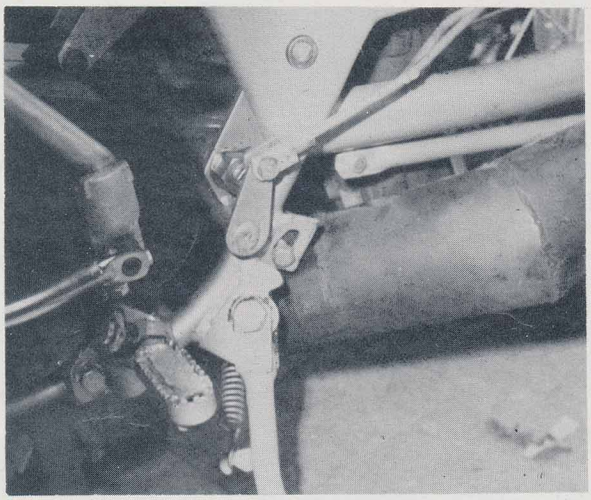
Remove masterlink and pull chain. We suggest re-installing master link in one end of the chain to prevent loss.



7

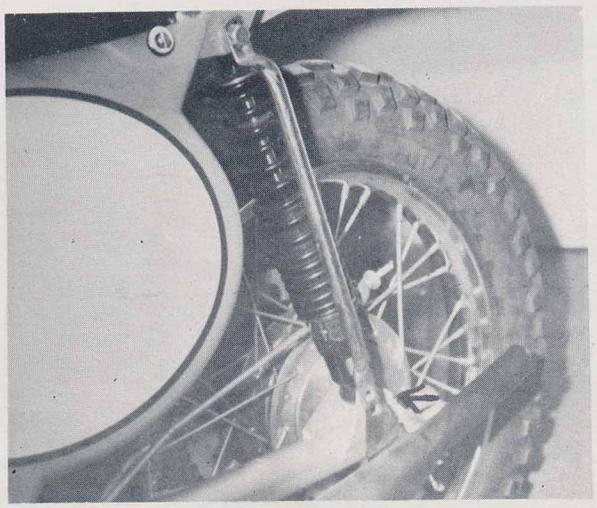
Remove the exhaust pipe mounting bolts, one is located at the head on the exhaust pipe. (Engine mounting bolt)

Note: if your motorcycle is an Enduro, check the Enduro section for exhaust pipe removal. Most everything else is the same.



8

The other bolt is located at the left side of frame near kick stand.

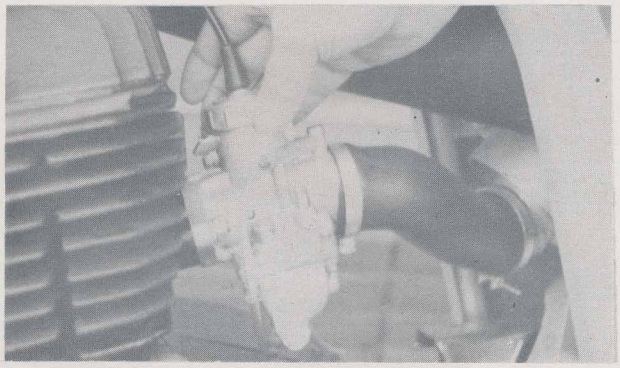


9

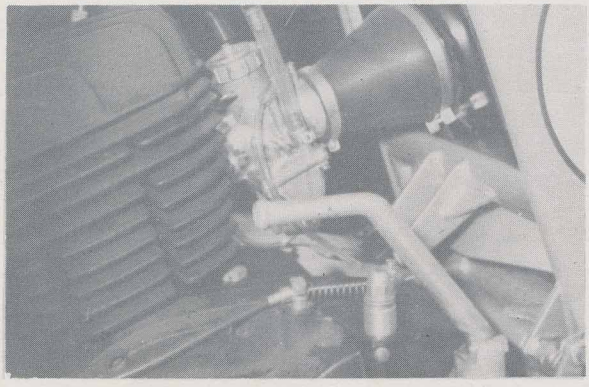
Remove bolt from the support bar at the rear of the exhaust pipe.

Remove the spark plug wire from the spark plug.

10

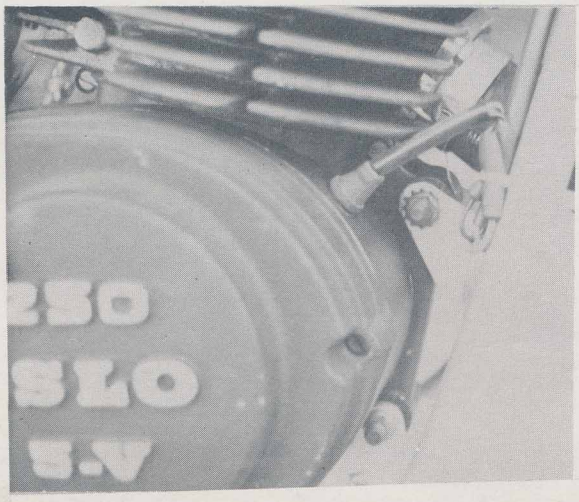


Remove the carburetor Slide assembly from the carburetor body.



12

Next loosen carburetor clamp and slide rubber boot off.



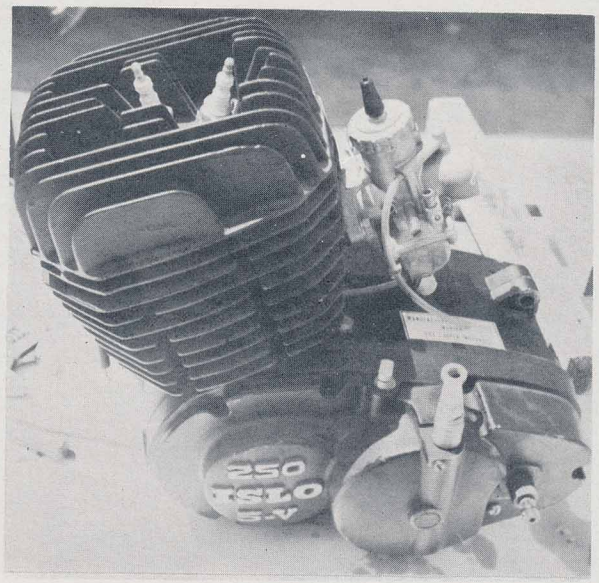
13

Remove the two front motor mount bolts and the two rear bolts, and the engine is ready to come out. Bolts-14mm & 11mm.

Note: Now is a good time to drain the gear box oil.

NOTE!

It is not necessary to pull the engine to do a top end. Remove engine only when splitting cases.

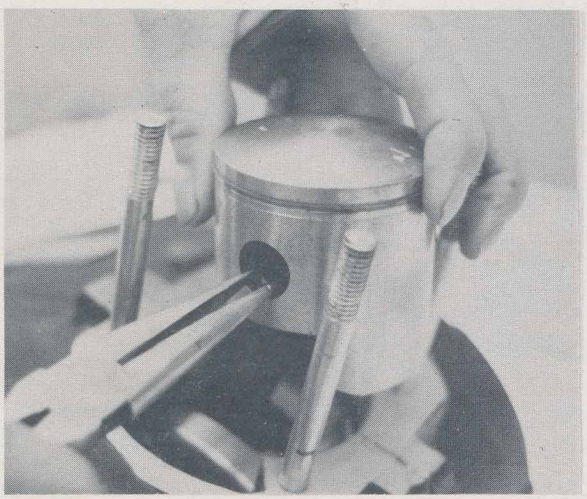


Dismantling the Engine

It is recommended that this section be read through carefully before dismantling the engine. NOTE!!!! All nuts and bolts on the engine except two are right handed. The two left handed are the counter sprocket nut and the clutch holding nut. This will be noted in its proper place.

14

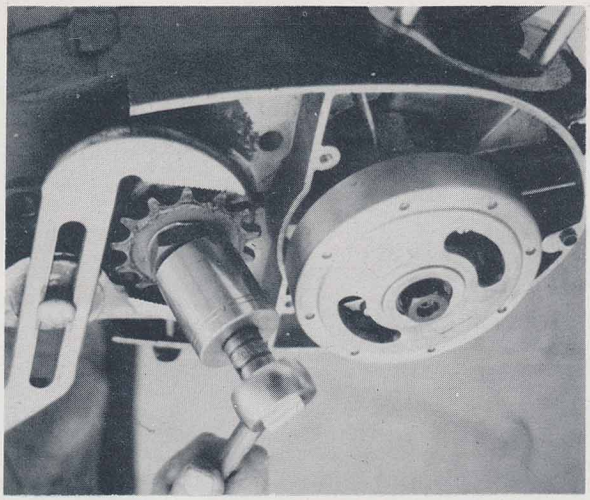
Remove cylinder head (4) 19mm bolts. Lift cylinder until cylinder sleeve clears engine cases far enough to allow a clean rag to be tucked underneath piston in case hole. This is to keep broken rings, carbon particles and dirt out of bottom end. Left cylinder free of studs.



Remove wrist pin clips.

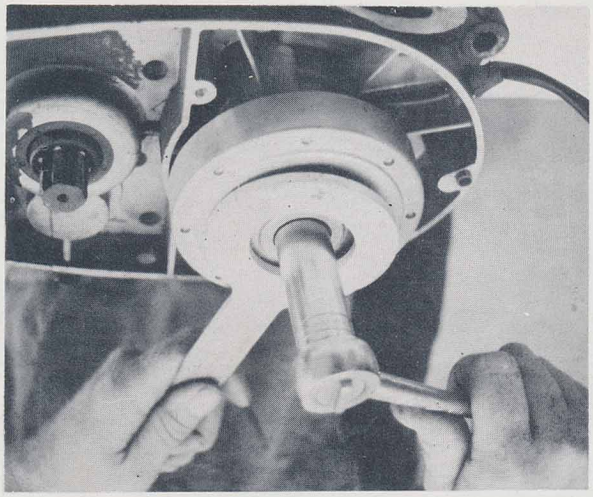
16

Pull wrist pin, remove piston and wrist pin bearing. Put everything together in a bag or box until needed. NOTE-- If the wrist pin is tight, warming piston will help to free it.



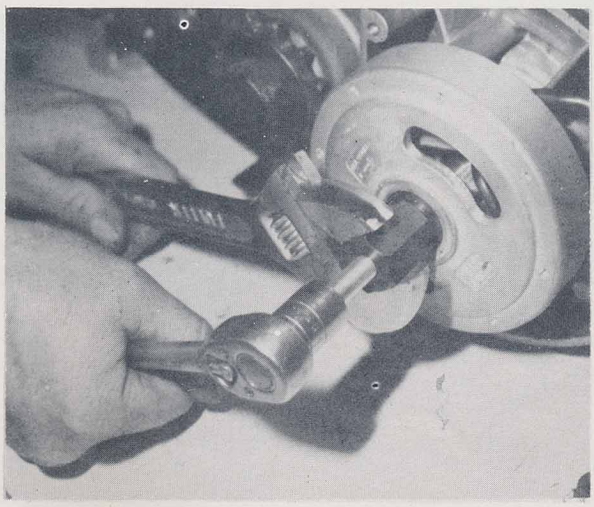
17

Lay engine on left side. Remove counter sprocket. NOTE- Nut is a left handed thread and comes off clockwise.



18

Remove flywheel nut.

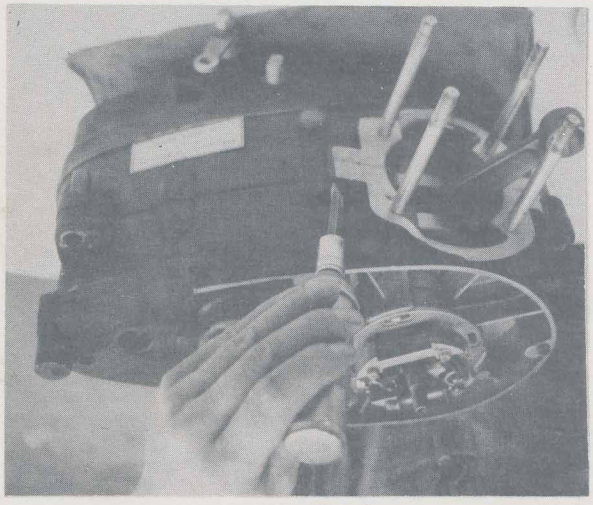


19

Install flywheel puller, part# FWP-100. Hold body and tighten bolt to pull.

20

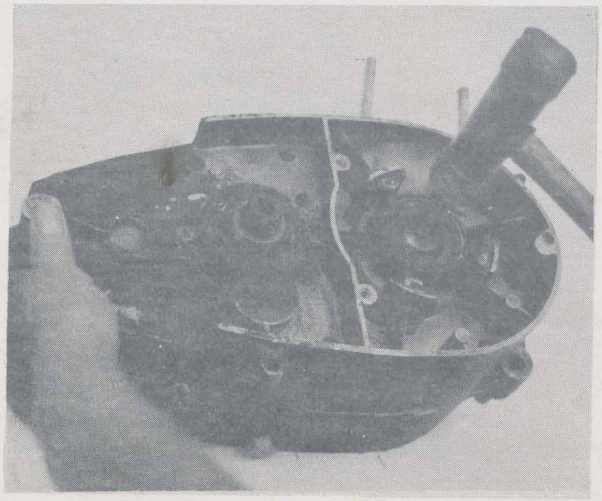
Drive out the bushings in each motor mount.



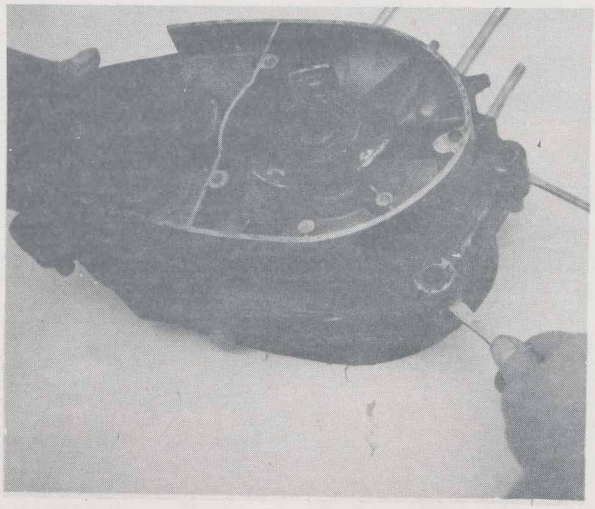
21

Remove case screws, (10) long and (3) short, 6mm, with a plastic hammer or lead. Tap lightly on crank end and sleeve pinion if you have to pry. Pry at motor mount area so not to damage any gasket surface.

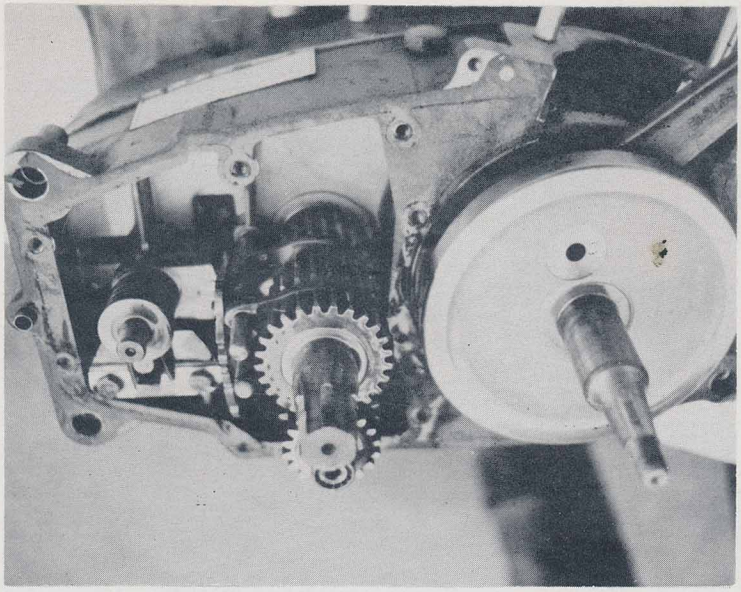
SEPARATE ENGINE CASES



22

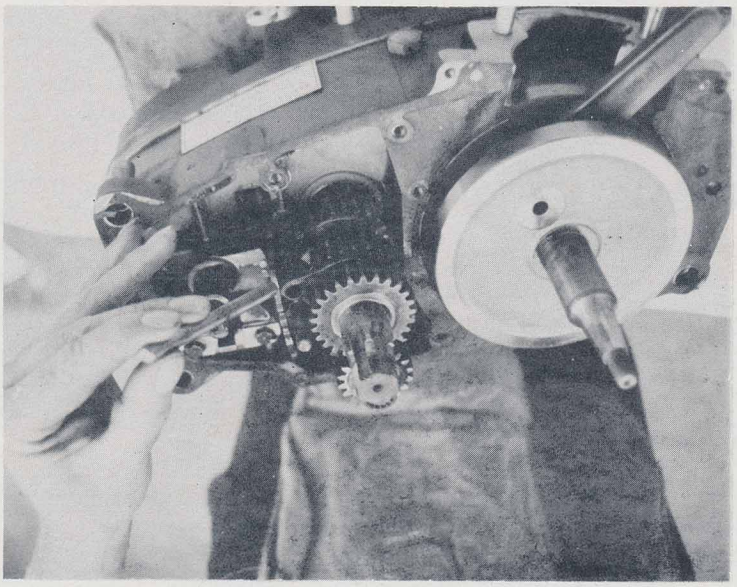


23



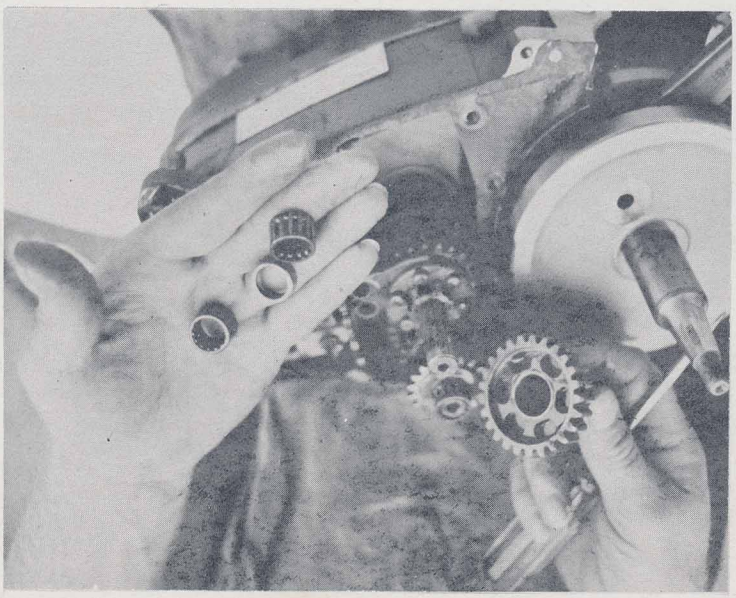
This is what the clutch case half should look like.

24



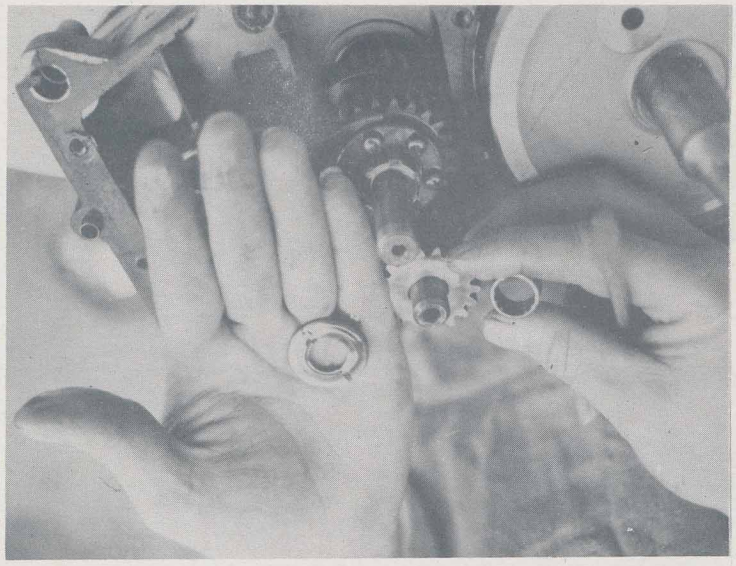
Remove the two shifting fork spindles.

25



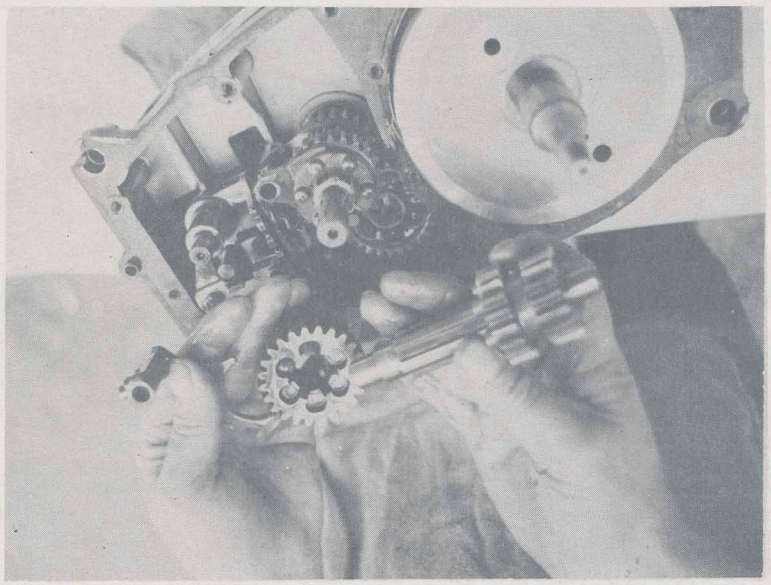
Remove the sleeve pinion gear. Take notes of the two needle bearings and spacer.

26



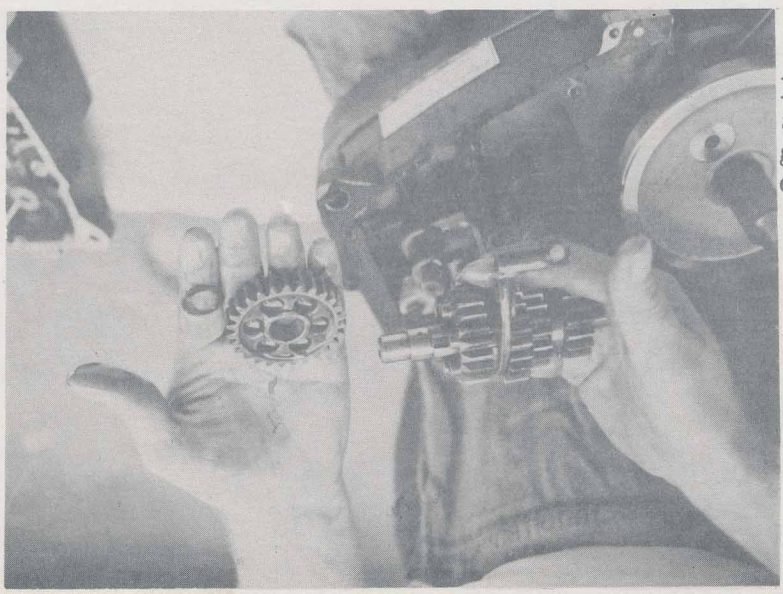
Off the end of the lay shaft, you'll find a needle bearing and a thick spacer.

27



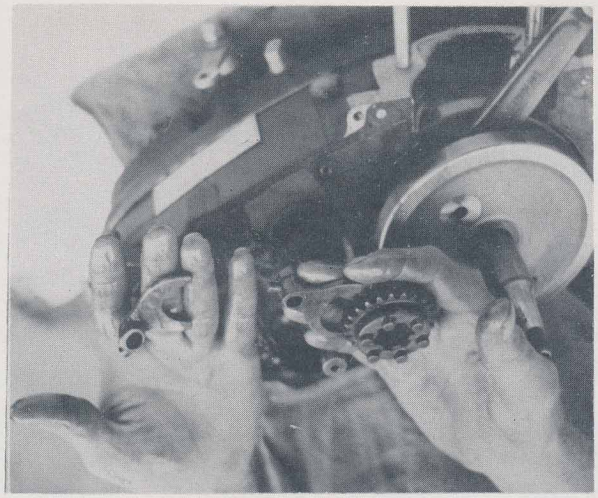
Pull lay shaft, slider gear and shift fork. Note: low gear in case.

28



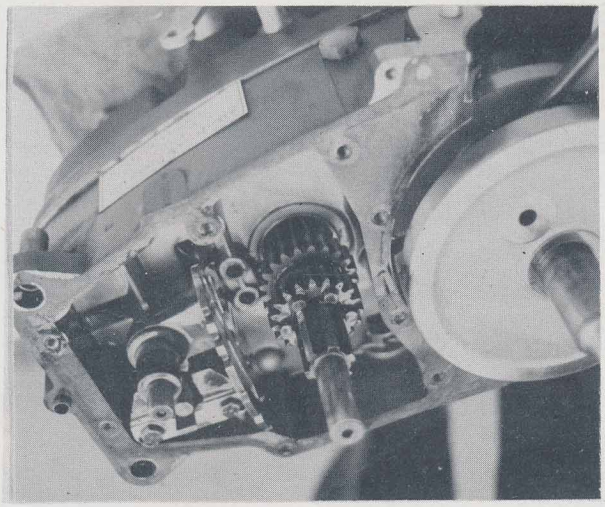
Remove low gear. Note spacer shim between gear and bushing in case.

29



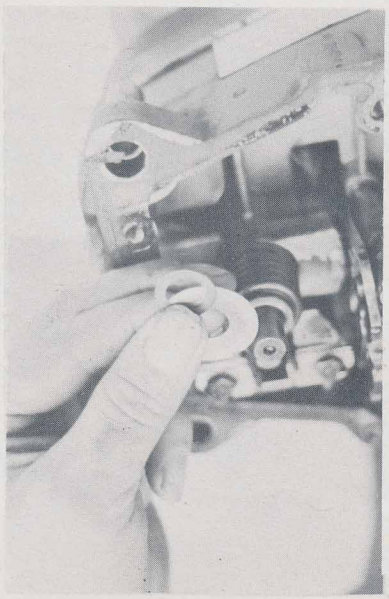
30

From the main shaft remove the slider gear and two shift forks. Note: the longer shanked shift fork goes on the bottom.

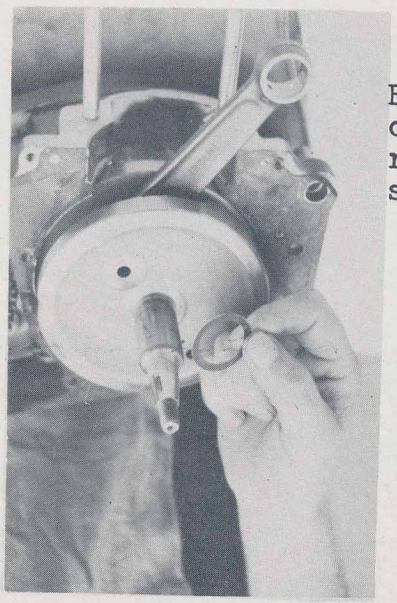


30A

You have now gone as far as you can go in stripping the trans. without removing the clutch.

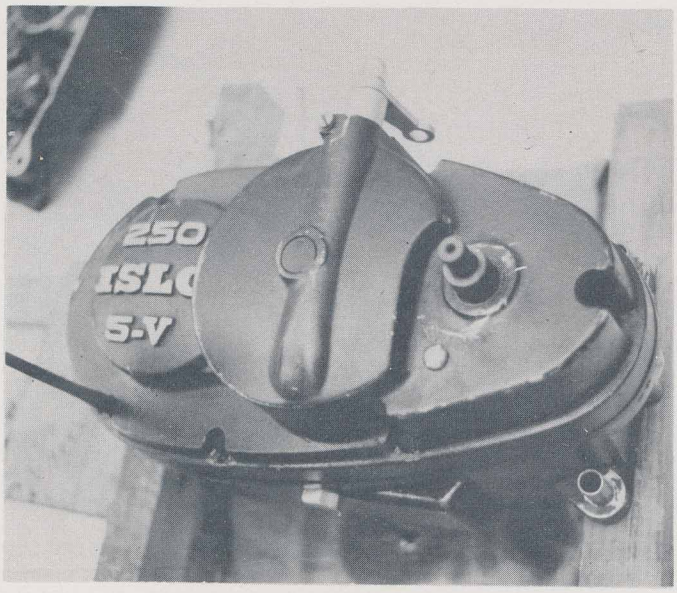


31



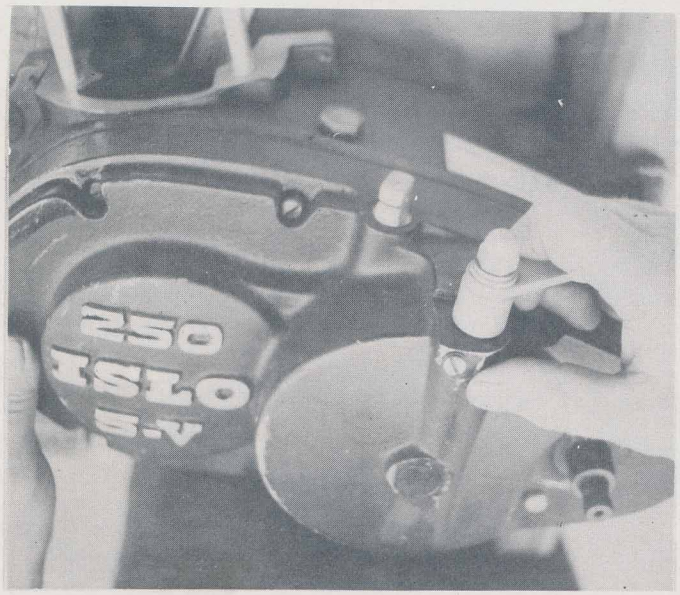
31A

Before turning engine over, be sure to remove spacers from shift shaft and crank.



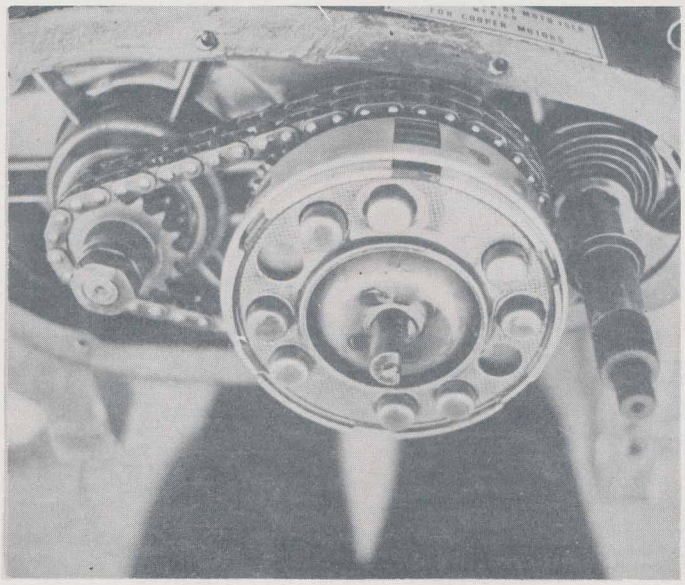
32

Remove clutch cover- 6 short screws and 1 long screw, 6mm. The long screw from rear hole.



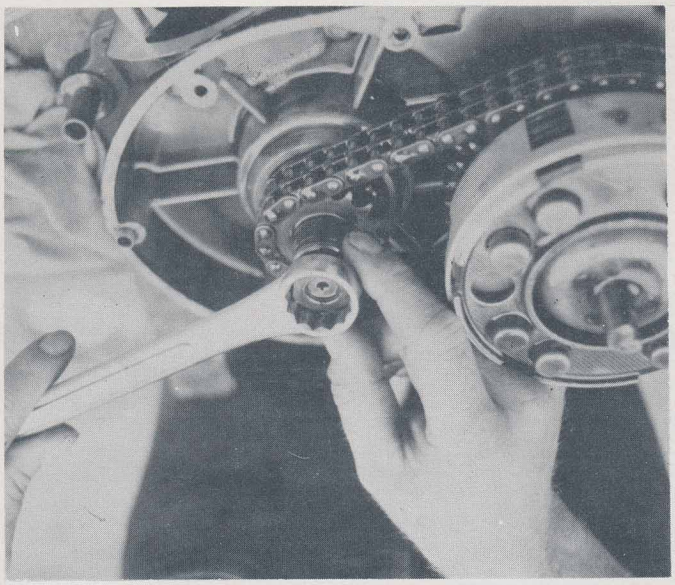
33

Tap case with a plastic hammer to loosen. Pull clutch lever backward to help remove cover.



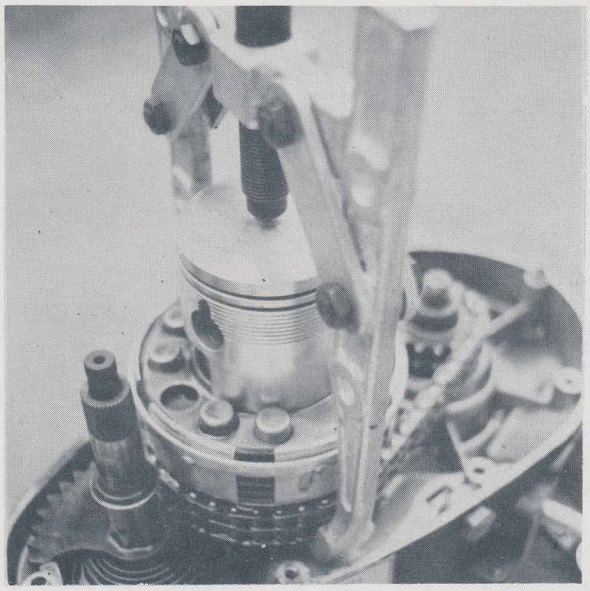
34

Exposed view of inside cover.



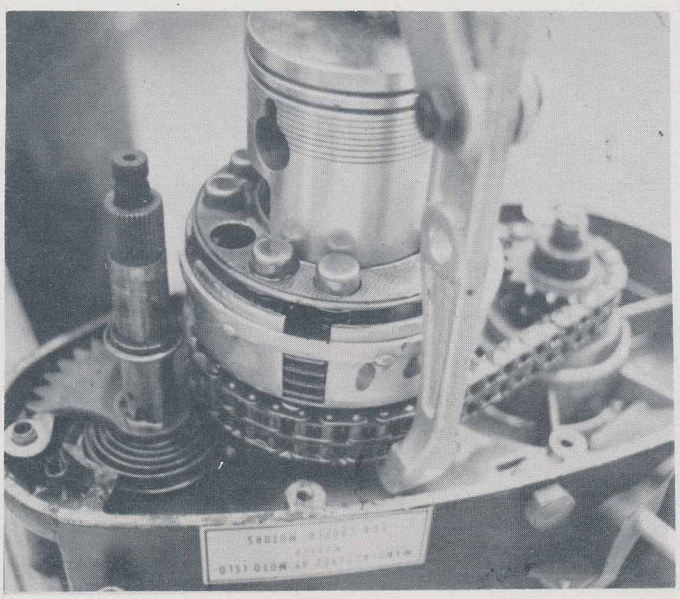
35

Remove engine drive sprocket nut, 22mm right hand thread.



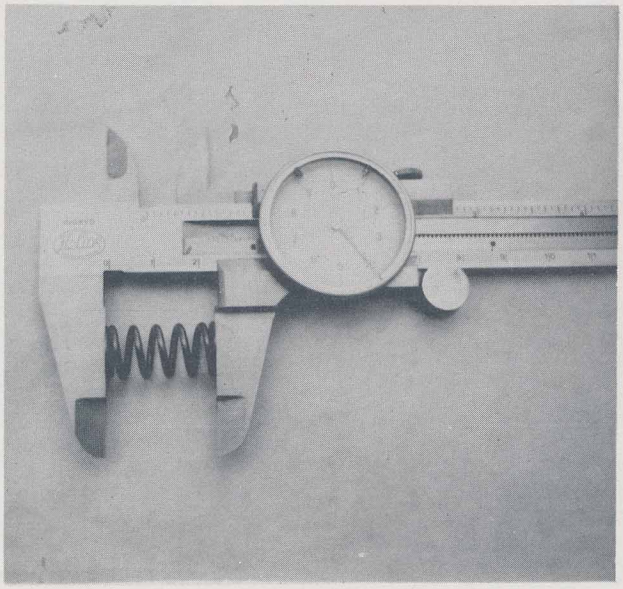
36

Next using an old 70mm piston you can compress the outer plate and remove the snap ring.



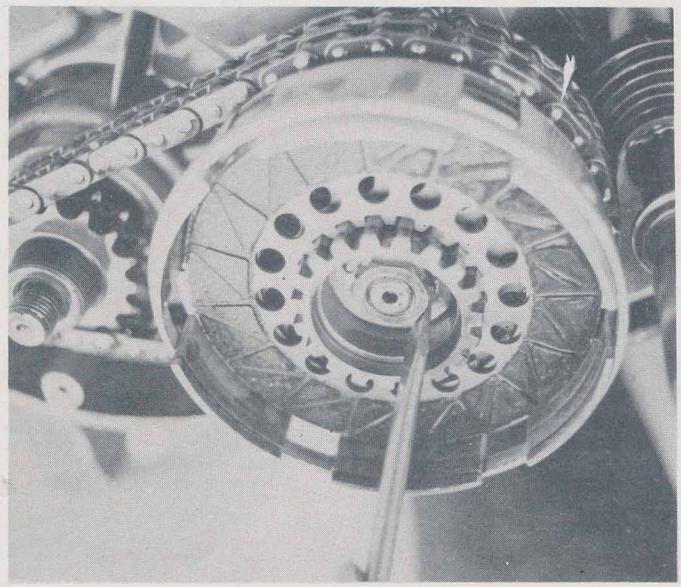
37

Note: There are 8 clutch springs and cups in a standard clutch. To make it heavy duty, add two more springs and cups.



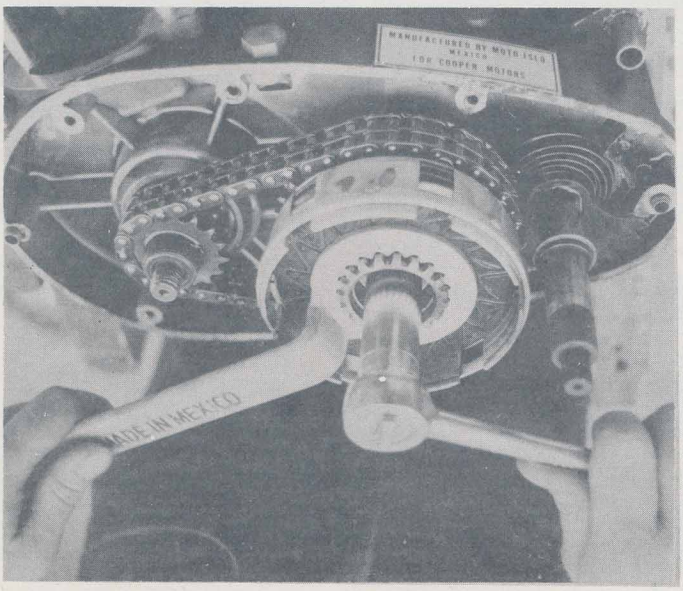
38

Correct length of clutch spring is .9449 inch. 24mm.



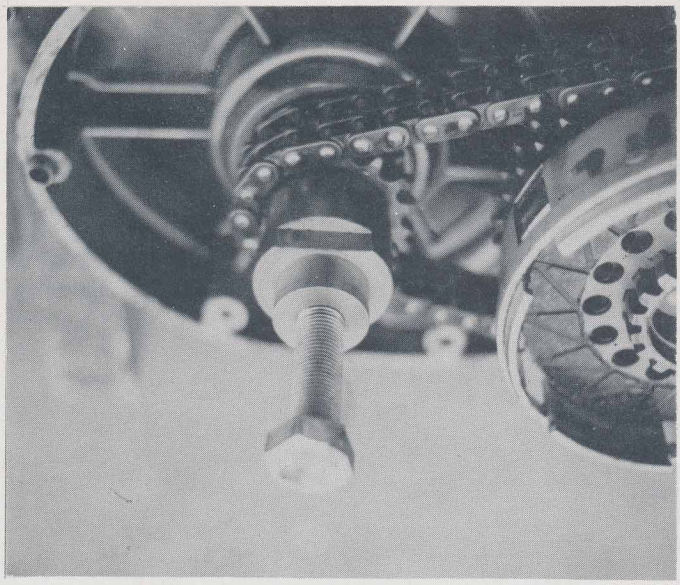
39

Un bend lock tab.



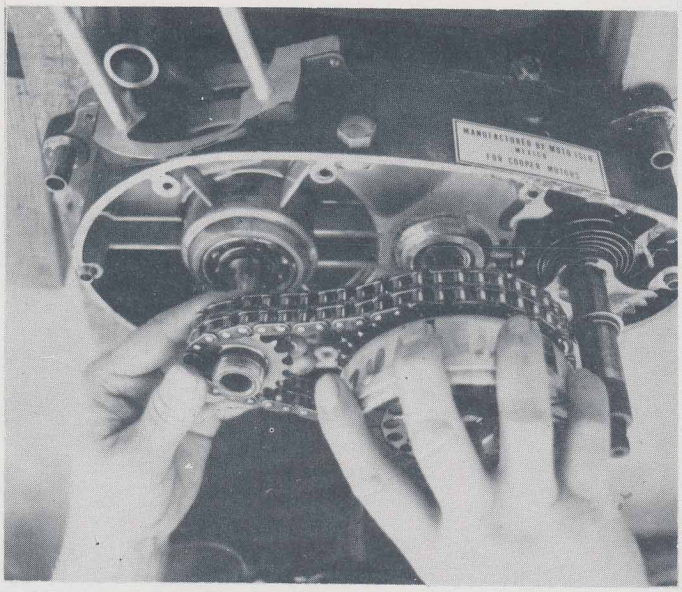
40

Remove clutch locking nut, 19mm left hand thread. Loosens clock wise.



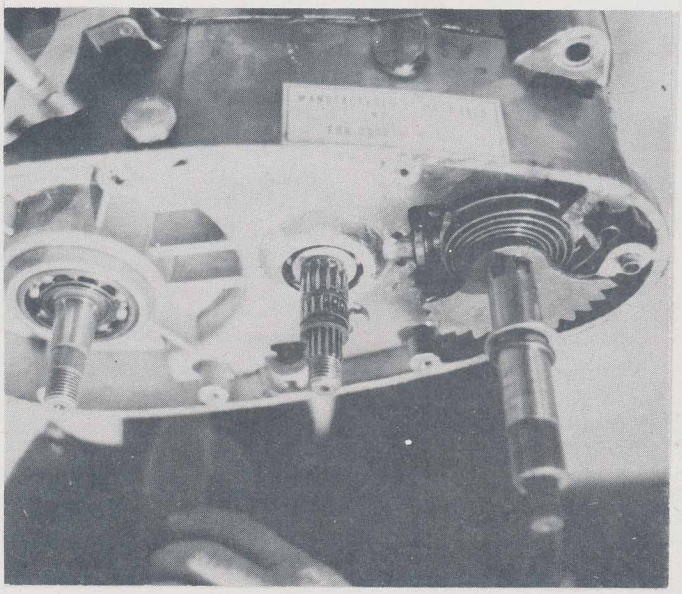
41

Now pull engine drive sprocket with puller tool--#CSP-100



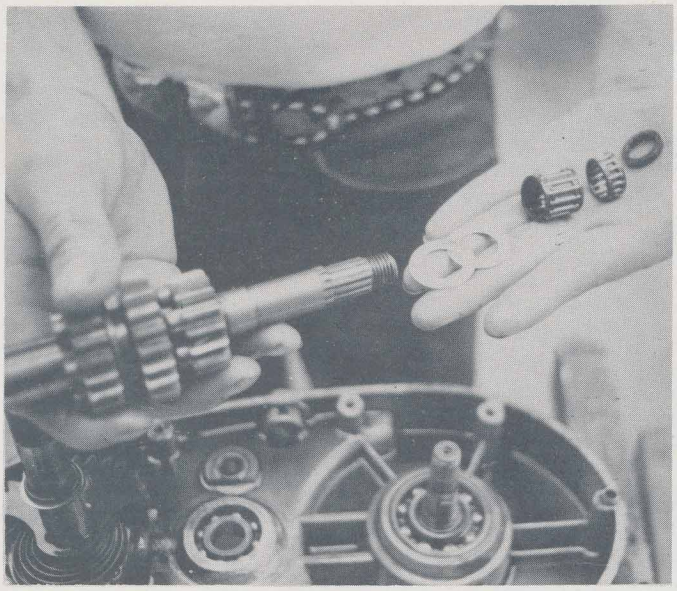
42

Remove drive sprocket primary chain and clutch housing all together



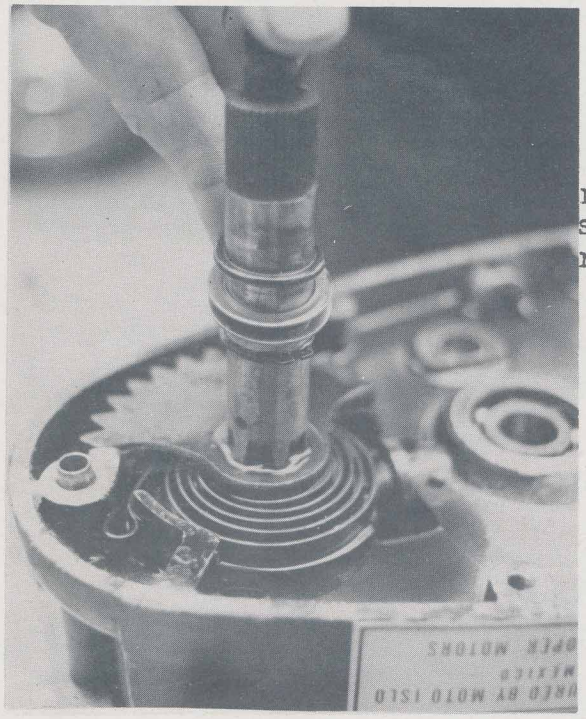
43

Take careful note of woodruff key in crank shaft. Also the needle bearings and spacers on the main shaft.



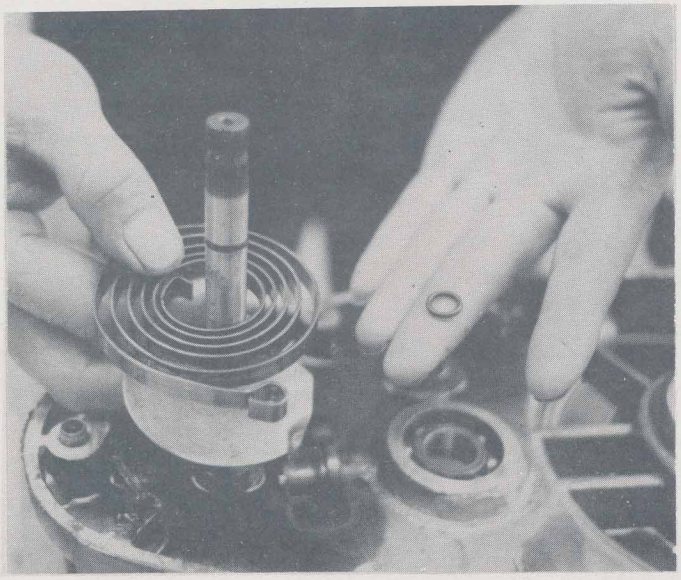
View of main shaft out of case. Note: there were two shims under needle bearings in some cases. There may be only one or more than two, depending upon spacing.

44



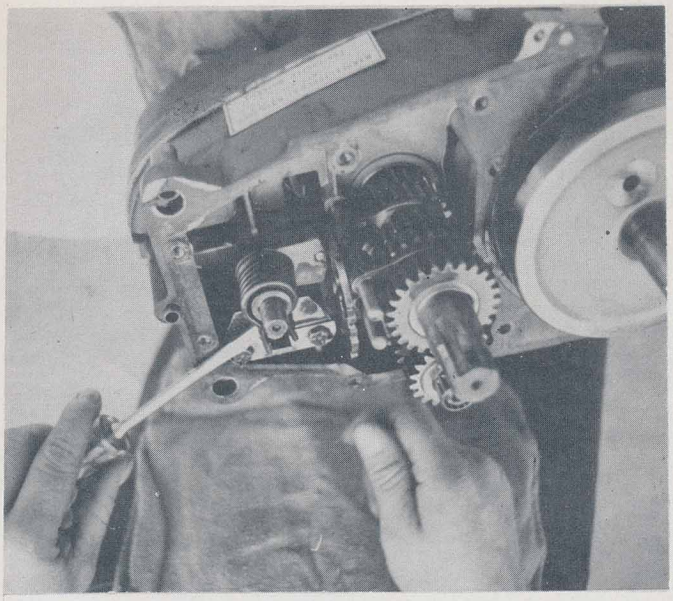
Kick starter mechanism may be removed by taking up spring tension and lifting up. Note: Snap ring, spacers and O-Ring.

45



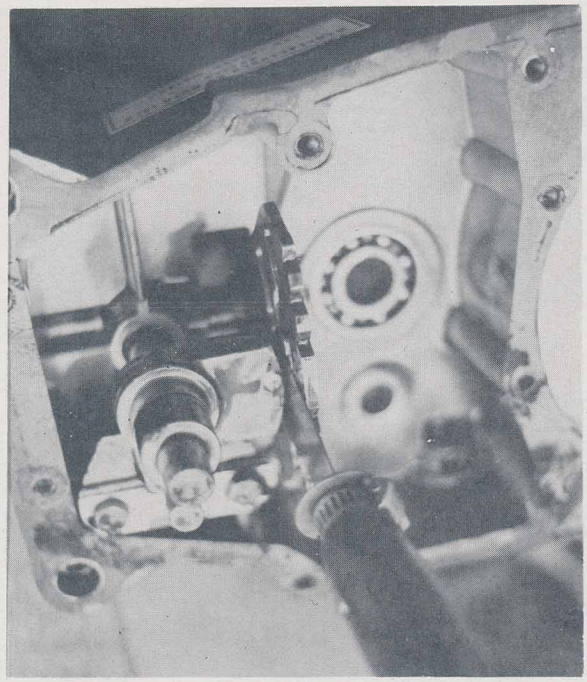
What remains on the shift shaft is the spring and spring guide washer. Note: The O-Ring shown is the oil seal between shift shaft and kick starter mechanism.

46



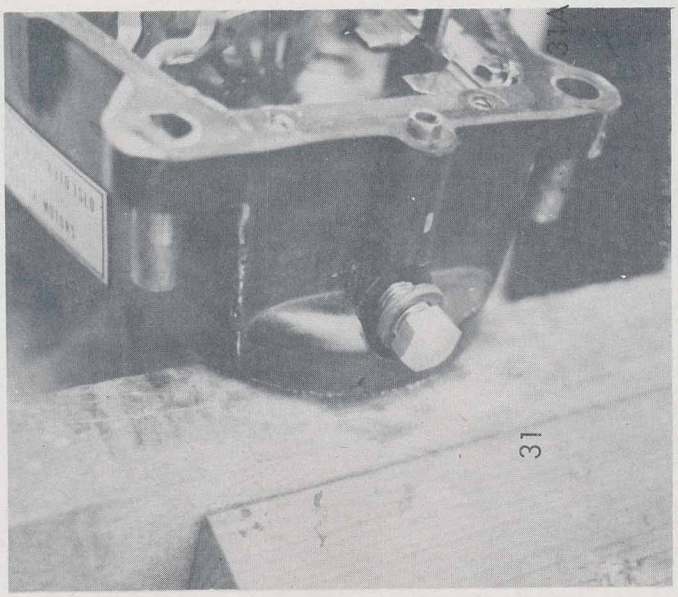
If the shift return spring needs replacing it can be handled by removing the mag side of the engine case. Take off the shims as noted in picture #31 and remove spring. For further info., check re-assembly section.

47



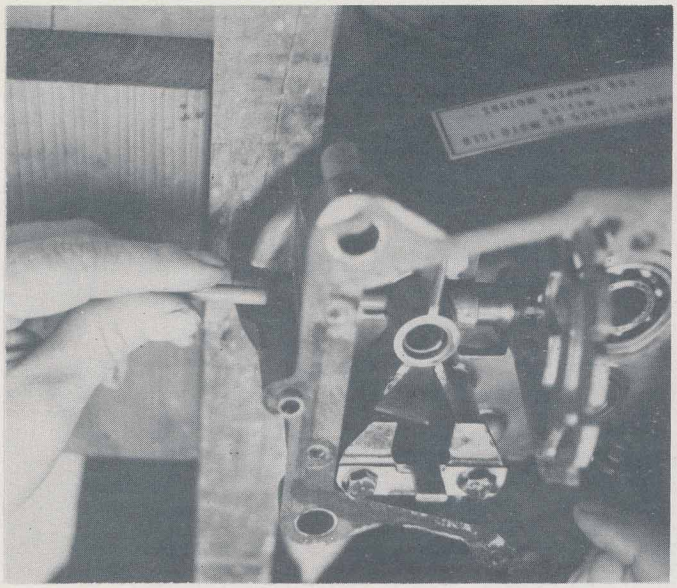
To remove shift shaft the use of thin blade putty knife is helpful. Slide between camplate and shift shaft depressing shifting pawls and lift up and out. Note: in some cases it is necessary to remove shift stop plate to remove shaft.

48



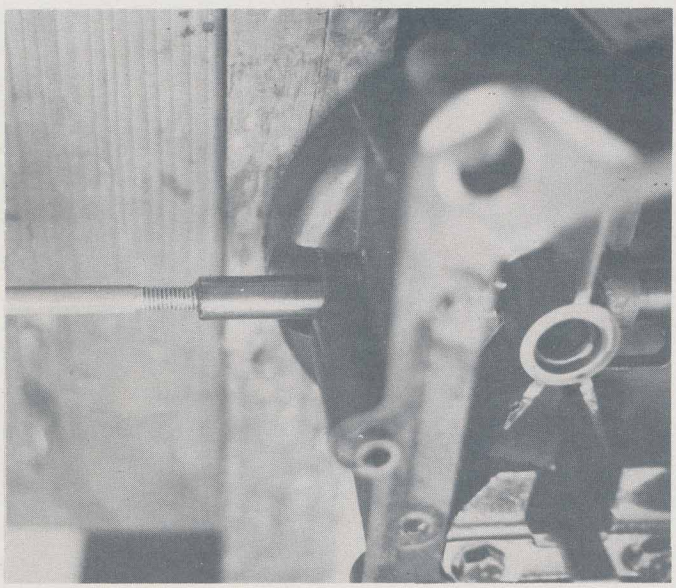
Plug shown here at rear of trans. must be removed to get to cam plate spindle.

49



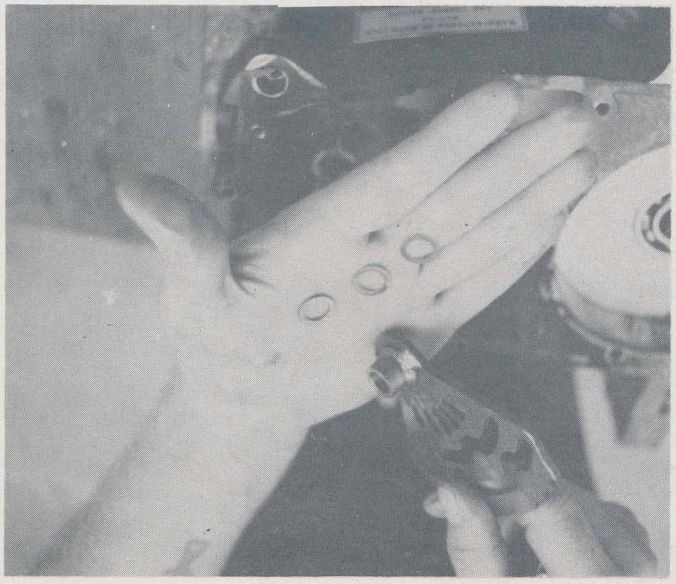
A ¼ bolt, 28 thread, 3 or 4 inches long will help to get spindle out.

50



Pull spindle

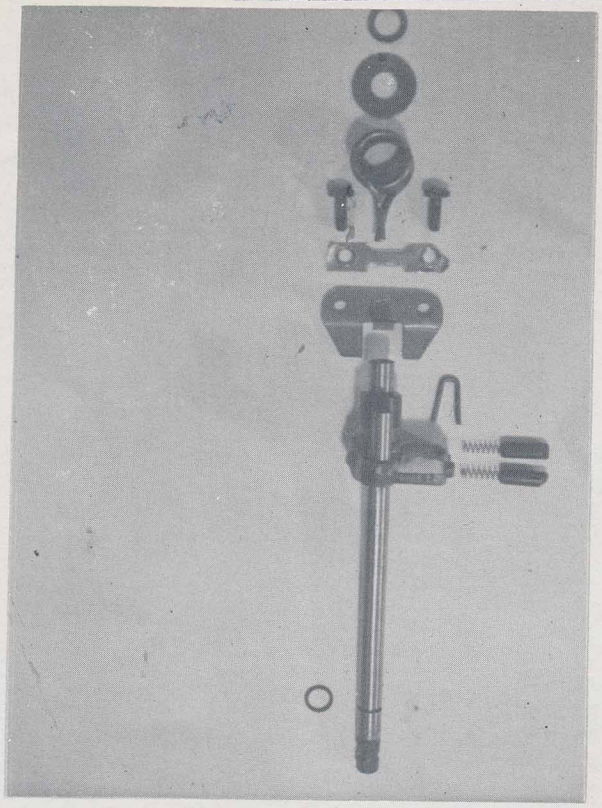
51



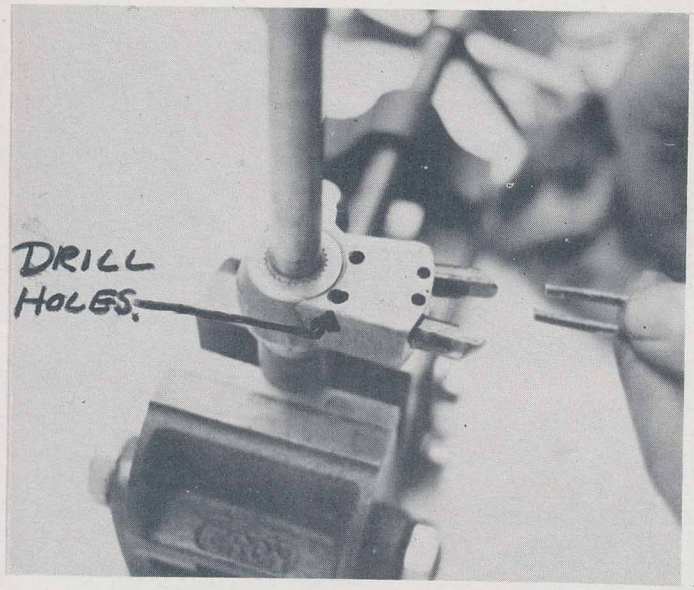
Shift cam is now free.
Note: Shims used for spacing.
For further information, check re-assembly.

52

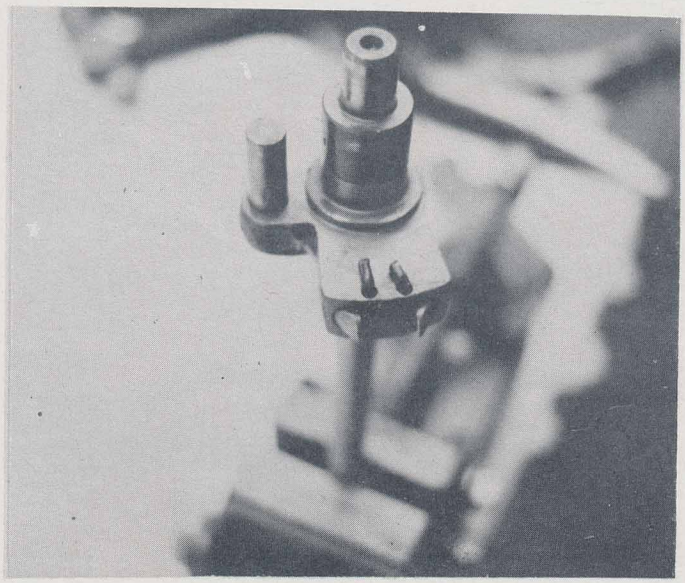
SHIFT MECHANISM SUB ASSEMBLY



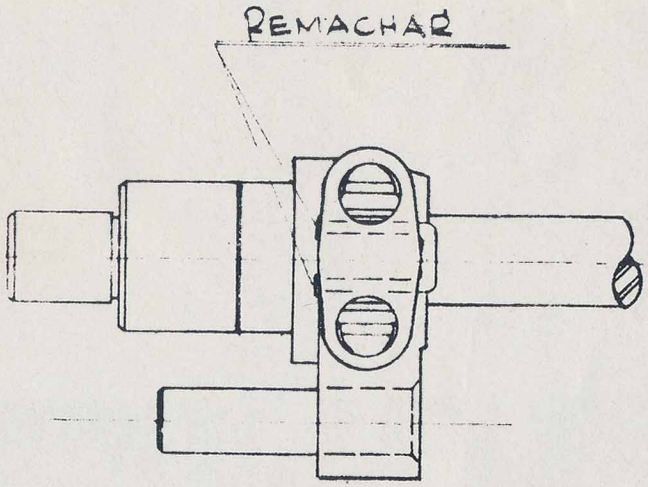
If a shift pawl sticks or brakes, remove wire. Replace part. Note: To preload the spring, you can install a ball bearing inside the shift pawl, or you may want to go to a heavier spring.

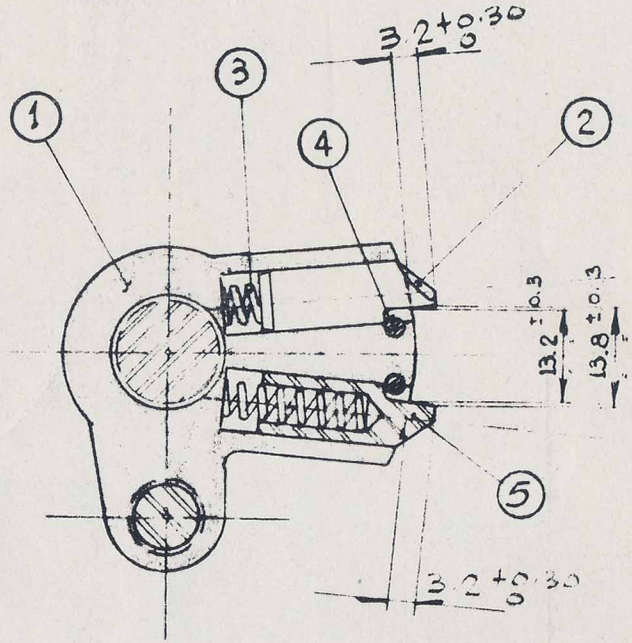


Note: Look in pawl holes in mechanism. There should be small bleed holes at bottom of hole. If not, drill a 1/16 hole to stop hydraulicing.



Install springs and pawls. Put in new wire and bend ends over.





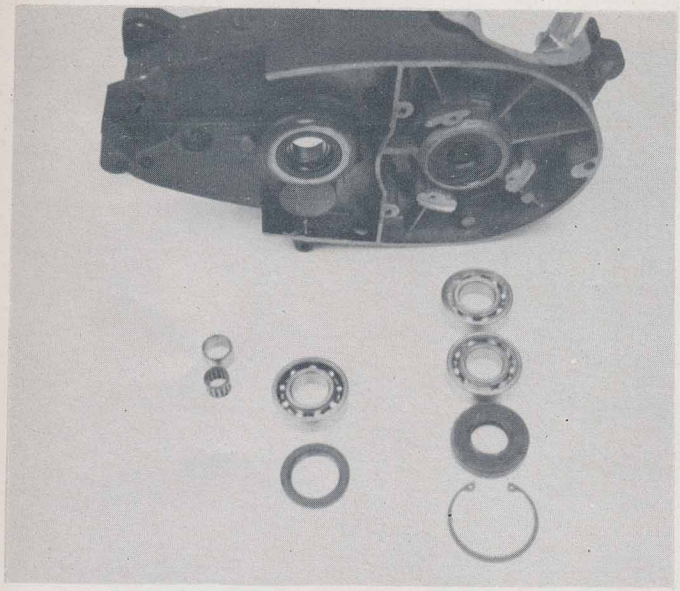
MILIMETERS

Nº	IBM	CEQ
1	14253500	1
2	14.25.853.00	1
3	14.25.852.00	2
4	14.25.851.00	1
5	14.25.854.00	1

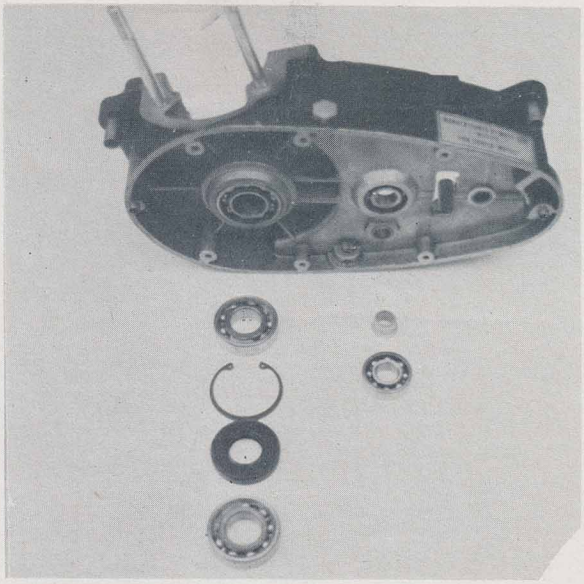
ENGINE RE-ASSEMBLY

After checking bearings, seals and bushings, and replacing what is necessary, it is time to re-assemble.

Note: Heat cases to remove bearings and to install.

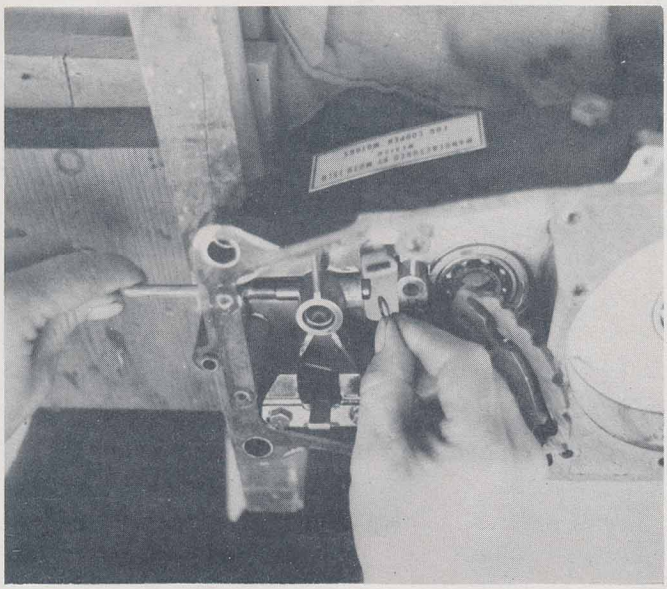


53



54

Re-assembly of shift mechanism and gear box. Before installing the shift cam, Grind 45° ramps as per diagram "A".



55

Installing shift cam. Be sure to space cam by use of shims, so as to have a 1mm distance between shift mechanism and 1mm between shift fork, per diagram "A-1".

Refer to diagram "A", "A-1", and "A-2".

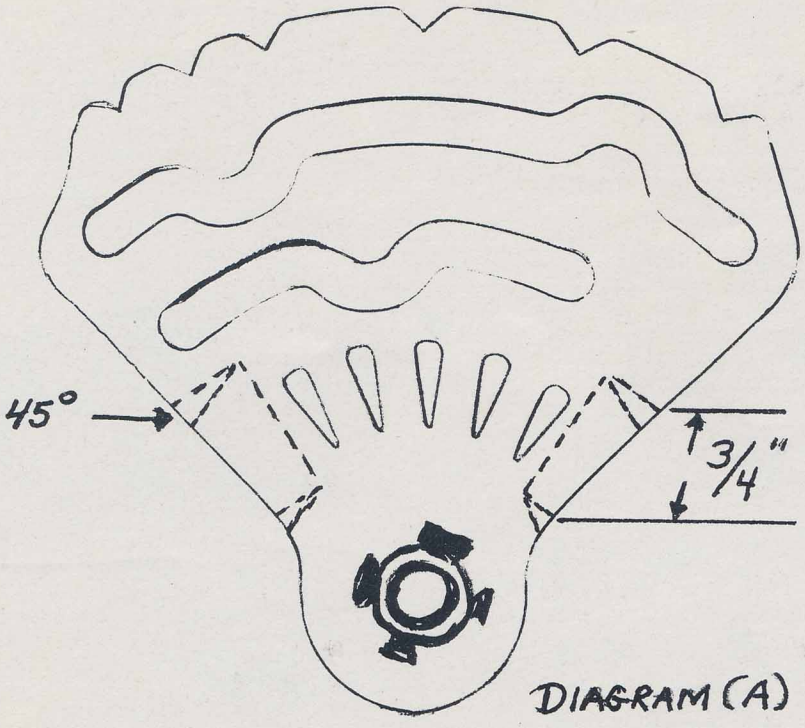


DIAGRAM (A) 56

The shift mechanism pawls have been known to get caught on the edge and stick. (Lock up) To check this problem, grind a 45° ramp 1/2-3/4 or 1" wide, whatever stone you have on your grinder.

Installing shift shaft and shift fork on spindle: Adjust cam as close as possible to maintain 1mm distance between shift mechanism and fork, as per diagram A-1. After shimming cam up as close as possible, leave shift shaft in place. Note: On following page, diagram A-2; these tolerances must also be checked, when setting up shift mechanism.

Thanks to Craig Scott

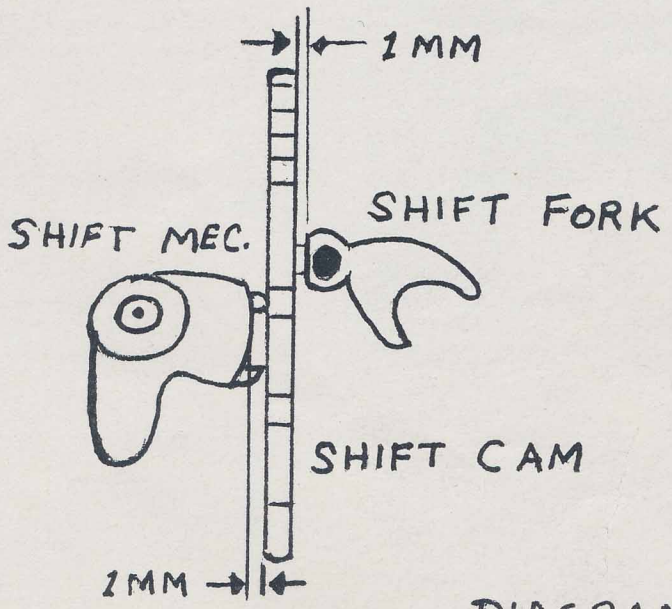


DIAGRAM A-1 57

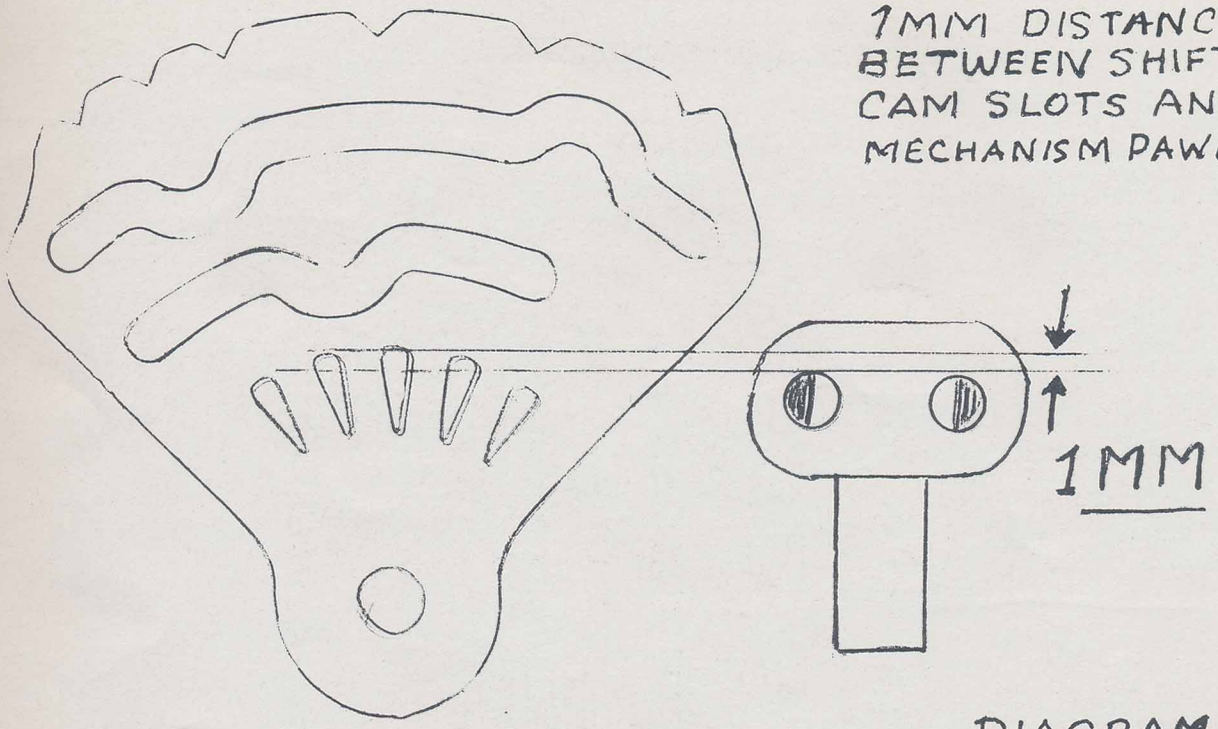
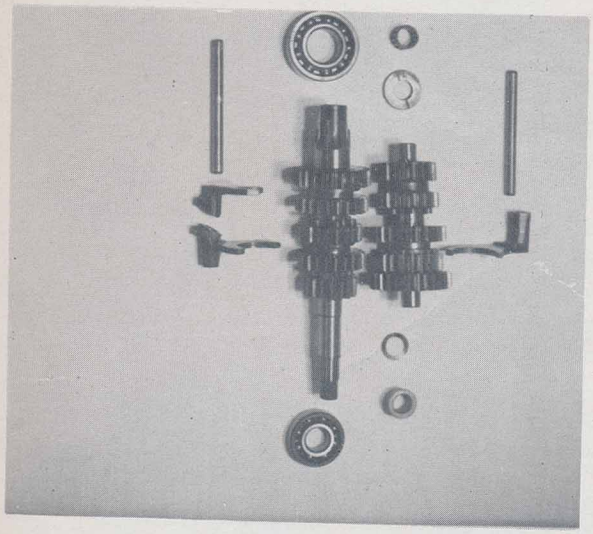


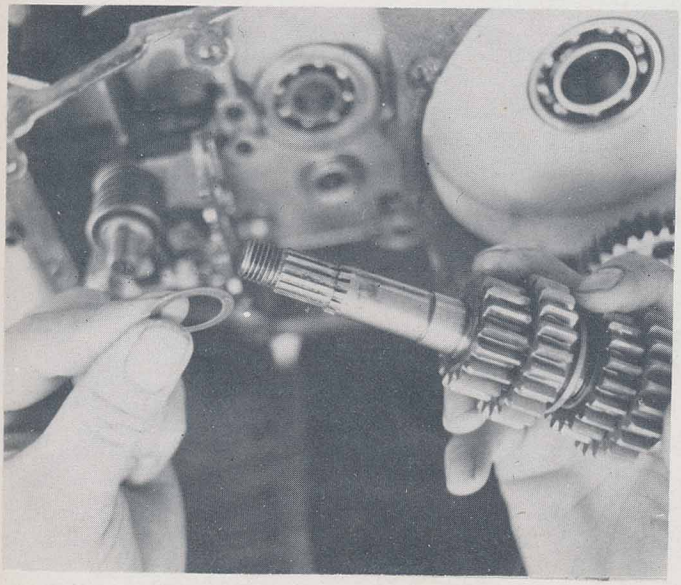
DIAGRAM A2

57A



57B

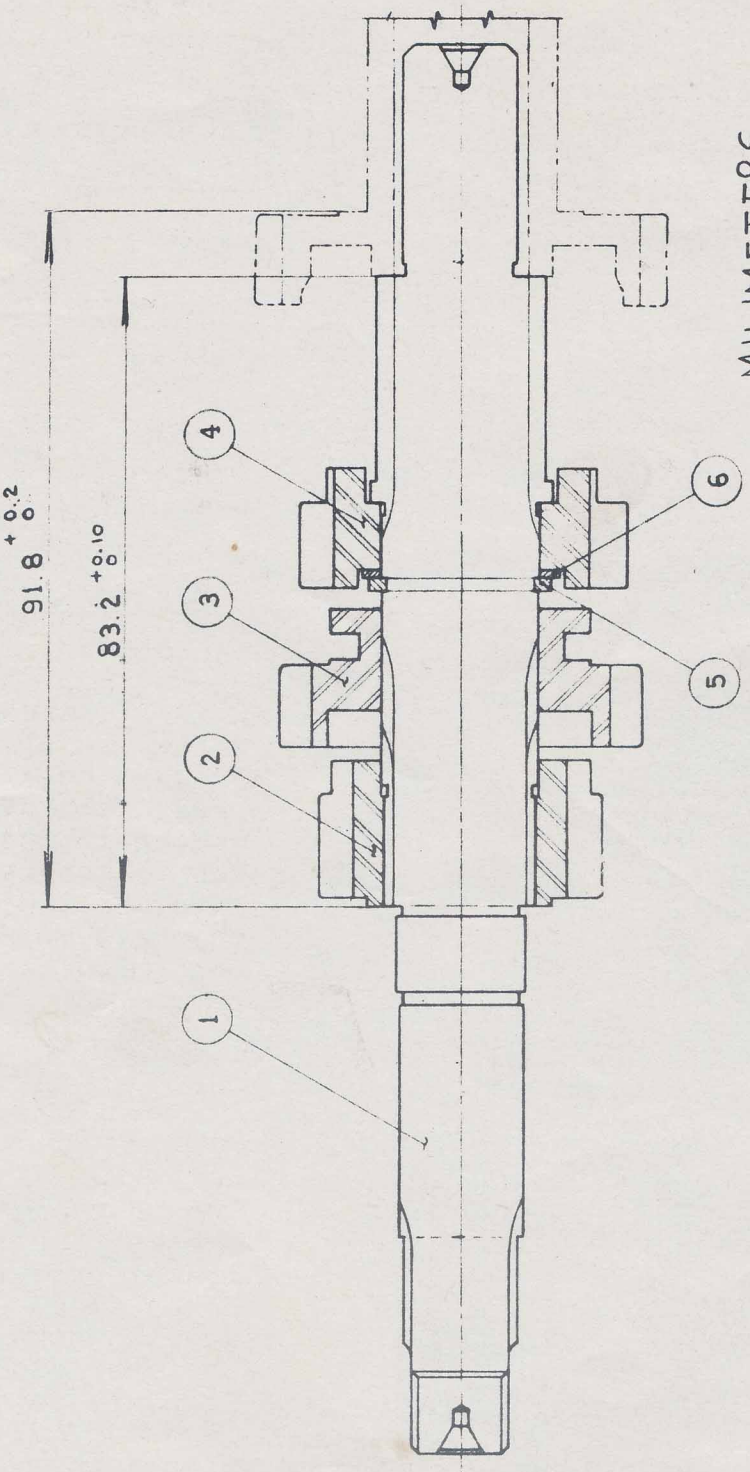
Install Main Shaft. Note: In picture it shows a shim between press gear on shaft and ball bearing in case. Not all engines will have a shim and some may have more than one shim.



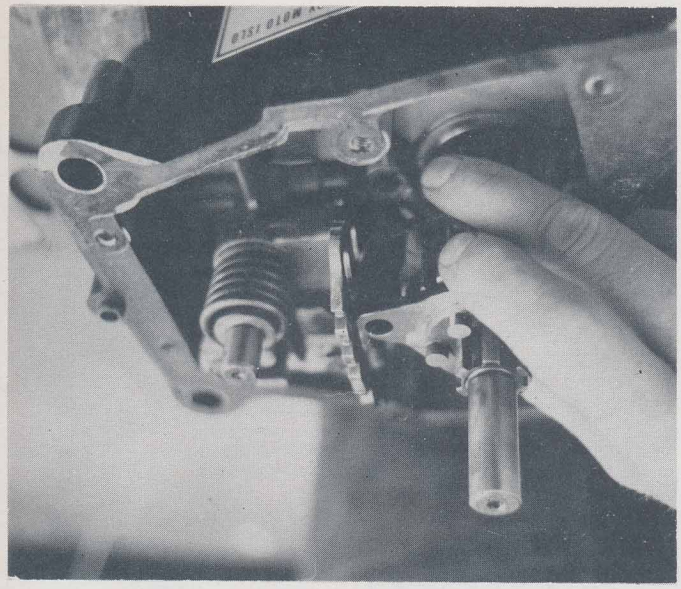
57C

The reason being is the shift fork should travel free in the cam plate slot. Also they should work smooth in the gear slot. Therefore, by raising and lowering the main shaft with a shim, or shims, we can achieve this.

MAIN SHAFT SUB ASSEMBLY

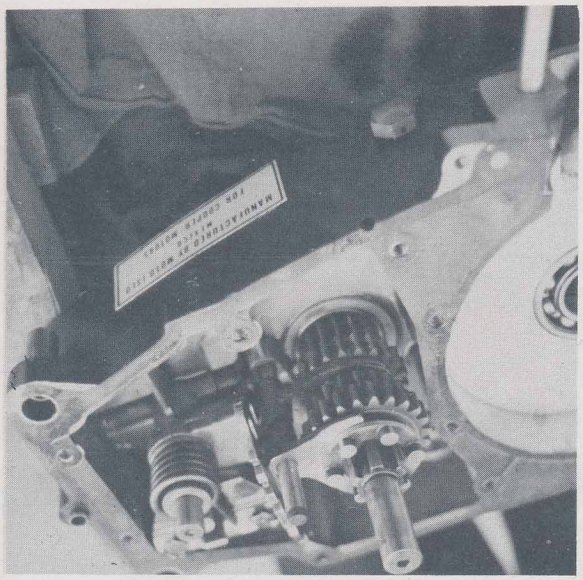


No.	No I B M
1	14 25 951 00
2	14 25 001 00
3	14 25 002 00
4	14 25 952 00
5	14 25 953 00
6	78 02 206 09



58

With the shift forks and spindle in place, shift the cam into gear to see if the gears are fully engaged. Note: Install sleeve pinion with bearings to check engagement. To know when you are in gear, the notch in the cam plate should line up dead center between the two shift fork spindles. (As per diagram "B".)



58A

The detent, located in the right hand case, helps center cam. Will explain more on shift alignment further on. For now, make sure shift forks are free and gears engage. It may be necessary to grind a little of the case away to get all the way into 5th gear, at the point the cam hits the case.

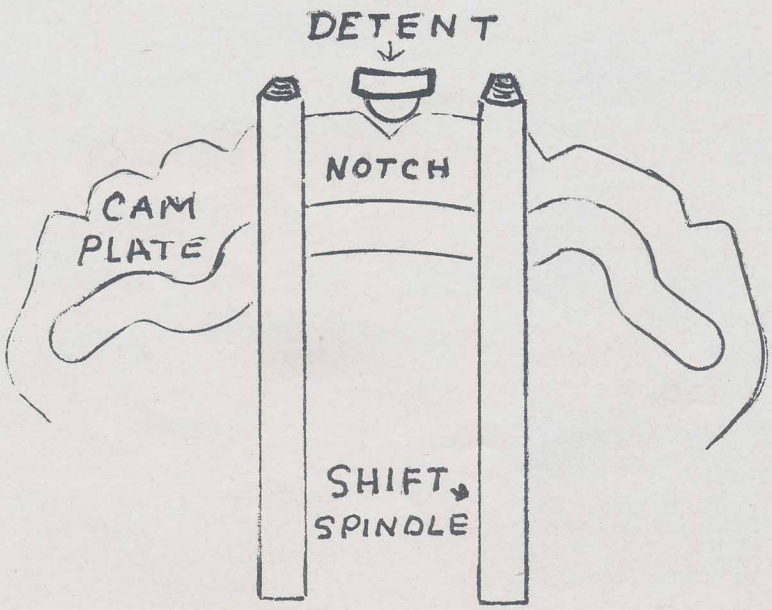
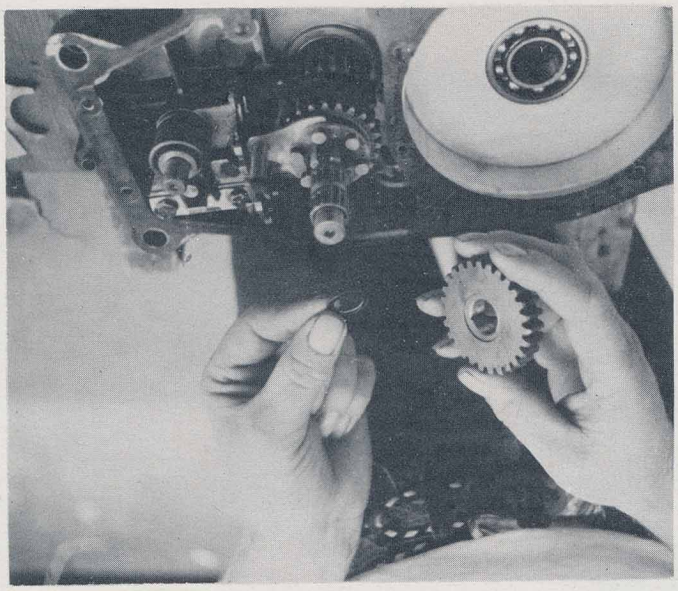
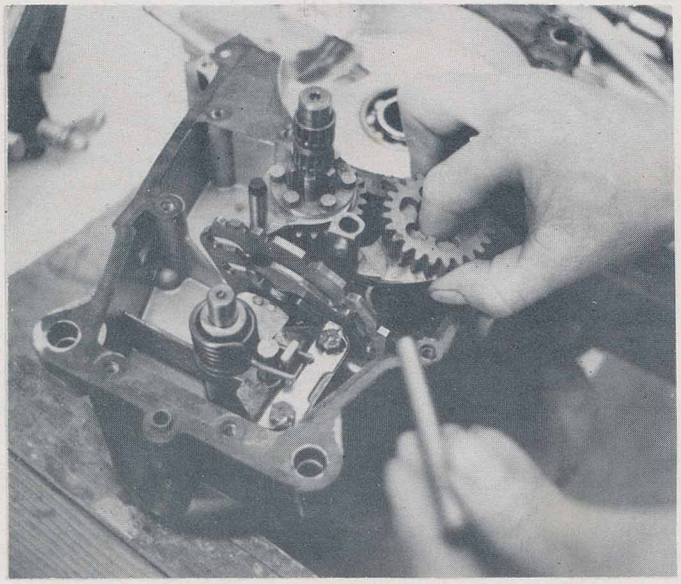


DIAGRAM B 58B



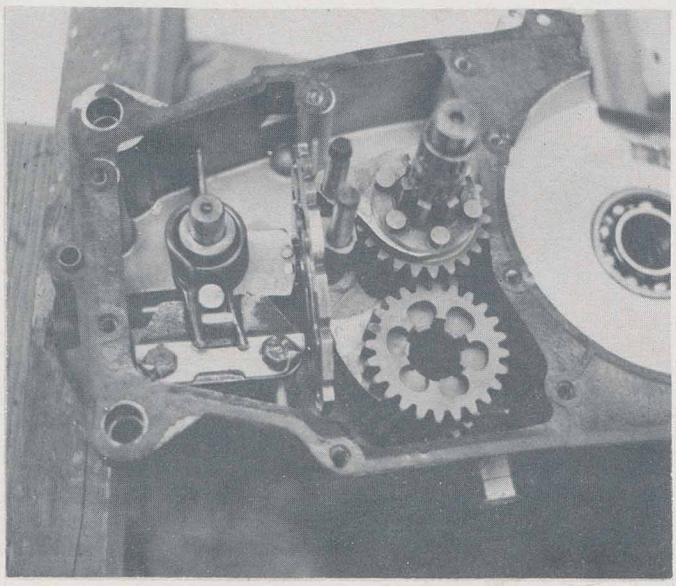
59

Next step is to install lay shaft. The shim spacer goes in first on top of bushing. Next lay low gear on top of shim

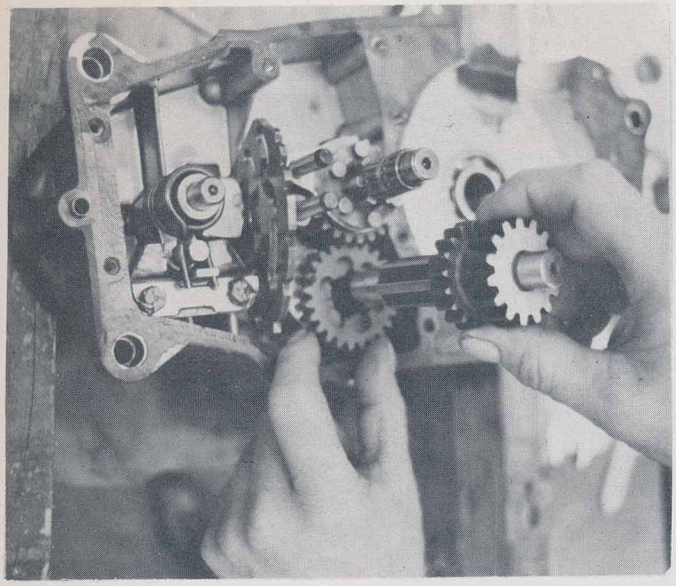


60

Take shift fork and slider gear and fix in place with fork spindle.

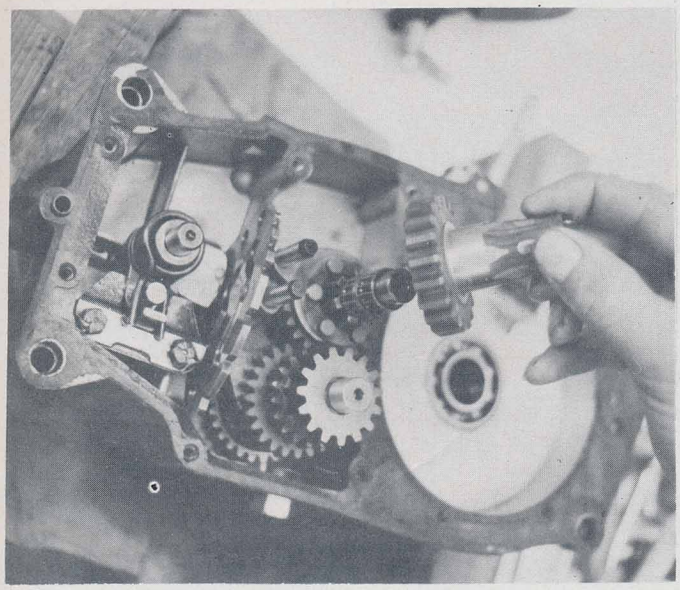


61



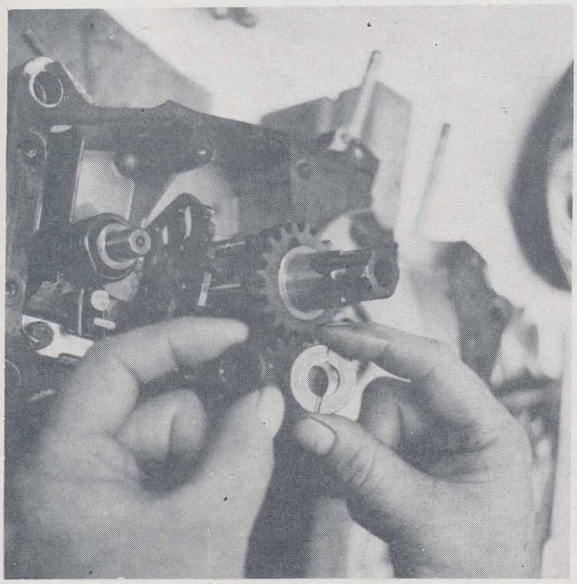
62

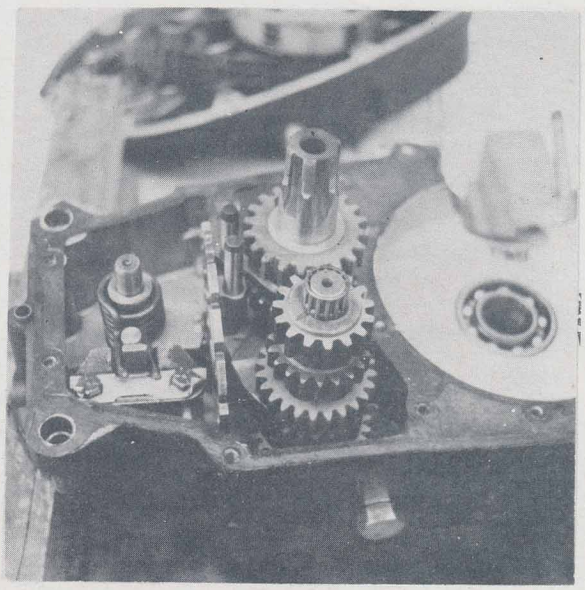
Now install lay shaft by feeding it down thru gears. Put the sleeve pinion in place. Note: the thick spacer and needle bearing go on end of lay shaft.



62A

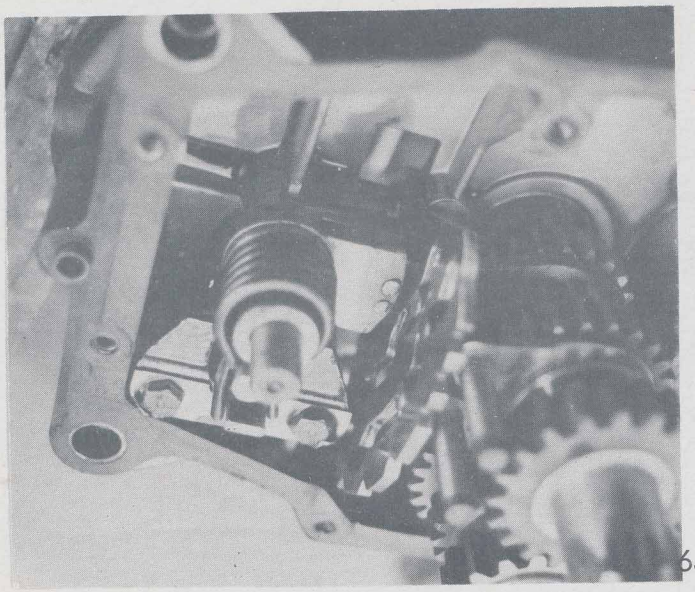
Shift thru gears and check engagement of gears on lay shaft.





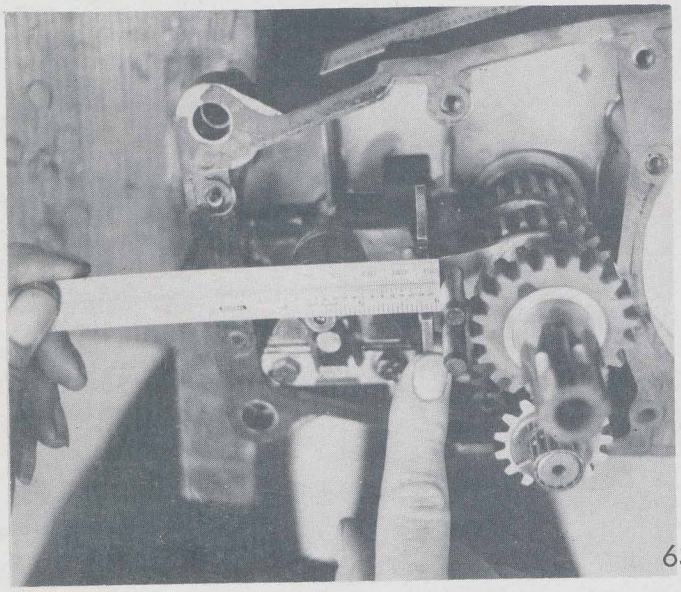
62B

SHIFT ALIGNMENT



63

Knowing that the cam notch must center between the fork spindles, it becomes apparent that the shift centering spring must stop the shift mechanism in the right spot. By laying a ruler across center we can see this. Per diagram "C".



63A

If it doesn't align, it will be necessary to bend spring to let mechanism travel further one way or the other. Note: By drilling a ¼" bolt out you can slide it over the end of the spring as a bender. Note: When bending spring refer to diagram "C-1".

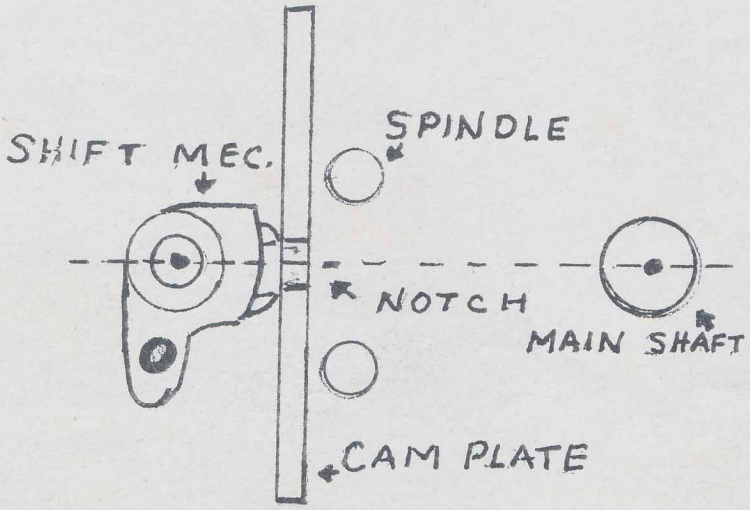
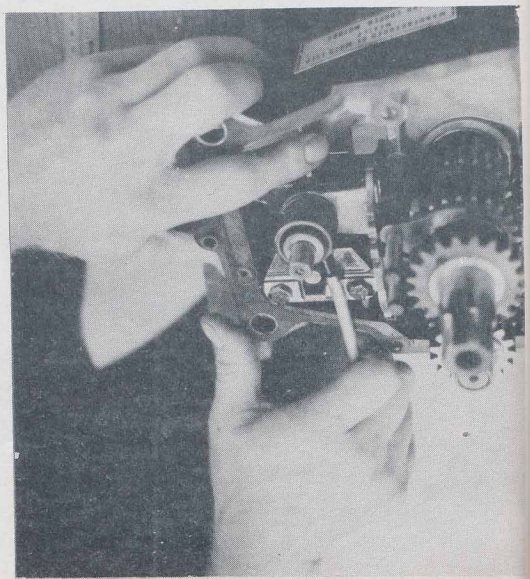


DIAGRAM C

63B



63C

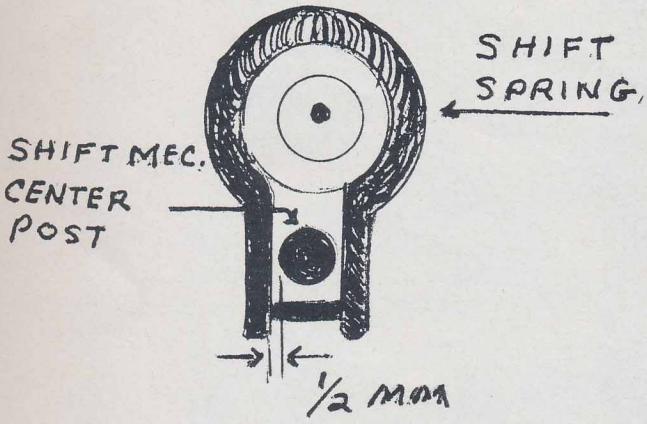
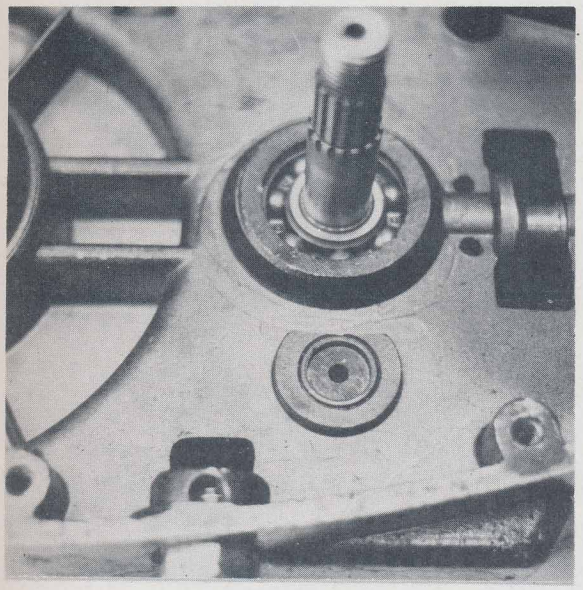


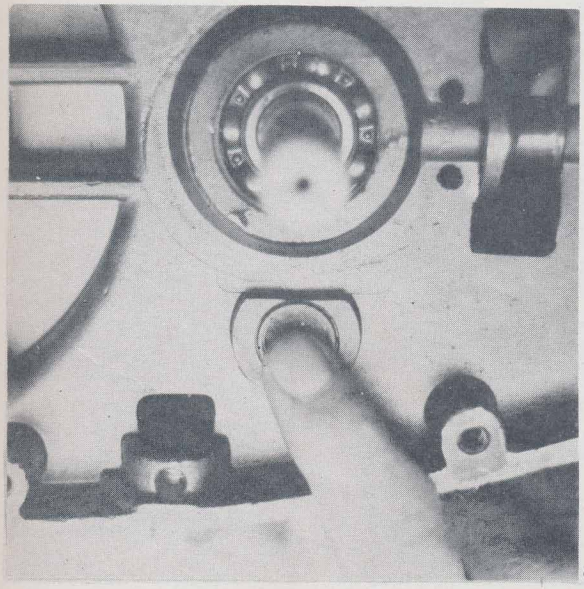
DIAGRAM (C1)

64

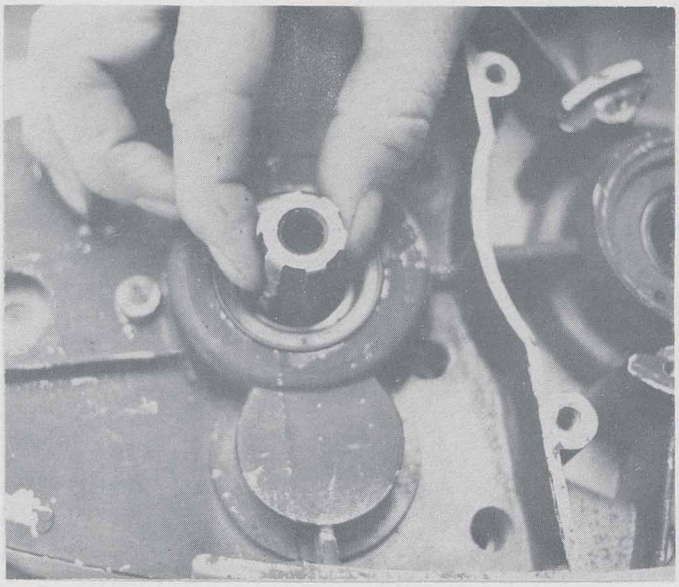
The shift mechanism centering post should not be tight between spring ends.
Allow: ½mm -- .020 play
After bending is complete, place spacer shims back on shift shaft. (Refer to picture 31)
Now put the center cases together without crank. Use two screws to hold together to check end play on lay shaft.
Turn engine clutch side down. Thru the bushing hole you can feel the play. You can dial indicate or calibrate in this position. Turn engine over push shaft in and read. Without a gasket it should read .005" to .010". With a gasket .015 to .020". If it is too tight grind some off thick washer on end of lay shaft, per picture 62B and 66A. IF loose, shim behind same washer.



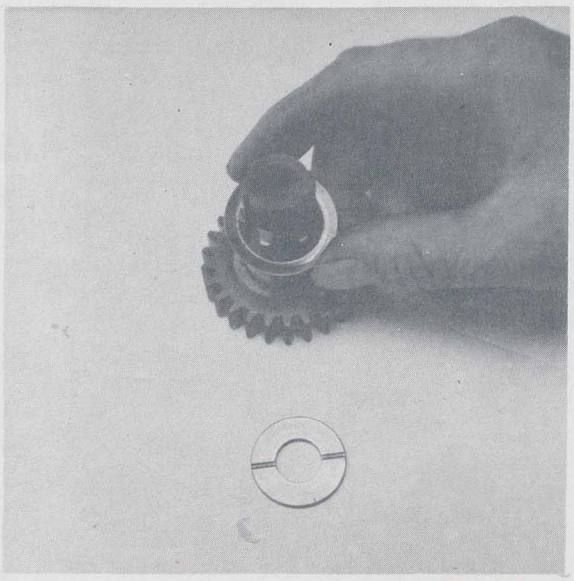
65



65A



Now check end play of sleeve pinion. First lightly tap inward to seat main shaft with a plastic hammer. Now, check play, .002" to .005". If loose, the same shims used on the crank shaft will work to space it. Per pictures 31A and 66A. Above tolerances with gasket. Check end play in shift shaft .002" or .003". If loose add shims. Refer to picture 31. Tolerance with gasket.

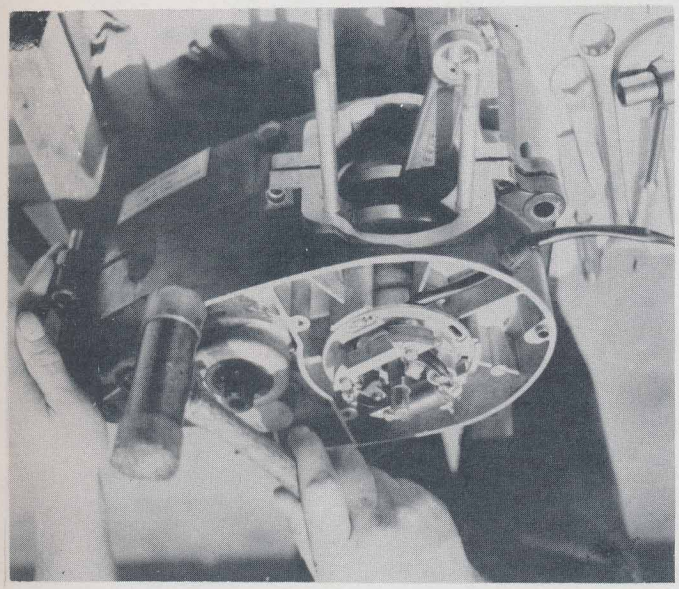


66A

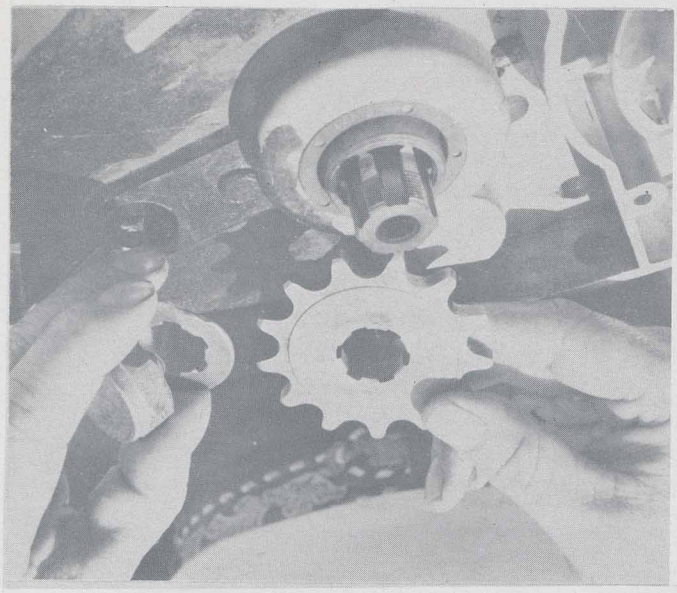
Next clean up crankshaft shafts with a light sand papering. Test in bearings for a slip fit. Now asseble case with a center gasket and crankshaft using two or three screws to hold cases together. There is usually a shim on each side of the crank. If the crank turns hard, remove the shim on the magneto side. The crank must turn free.

Now that all tolerances have been checked and corrected, assemble the cases. Use a good gasket sealer. Tighten case screws with an impact driver if possible.

Repalce engine mount bushings. Per picture 20.



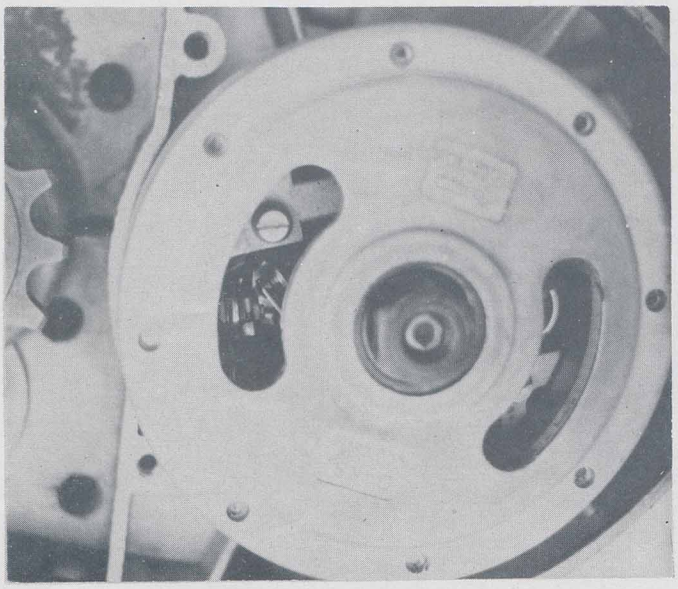
67



Install counter shaft sprocket. First install spacer, then sprocket, lock washer and nut. Note: there should be a rubber disc in nut to seal off oil.

68

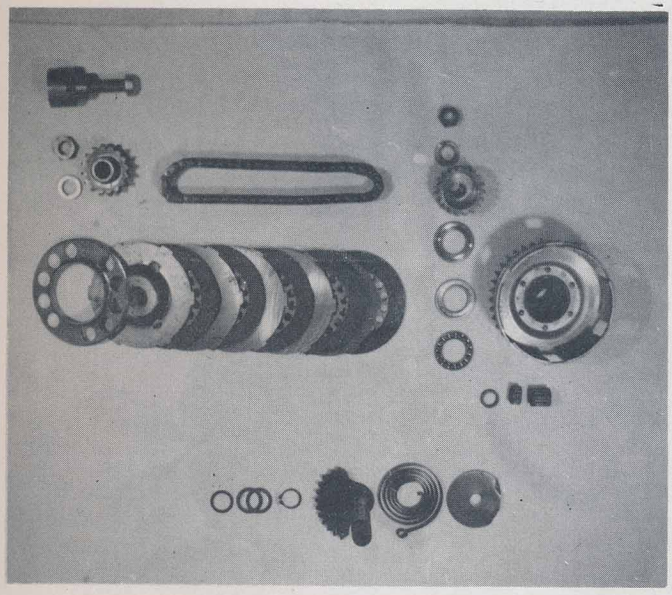
INSTALL MAGNETO FLYWHEEL



Before installing flywheel, clean up points or replace if needed. Next, install woodruff key in shaft. Align slot in flywheel shaft to woodruff key and slide on. Note: will instruct timing later on.

Thanks to Craig Scott

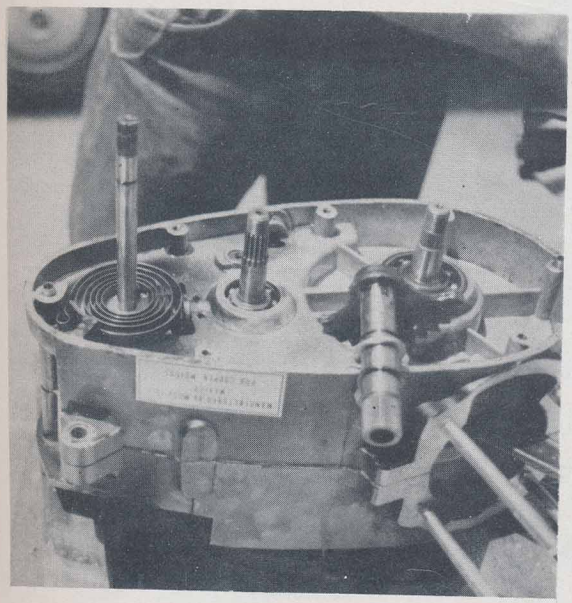
RE-ASSEMBLY OF KICK STARTER AND CLUTCH



70

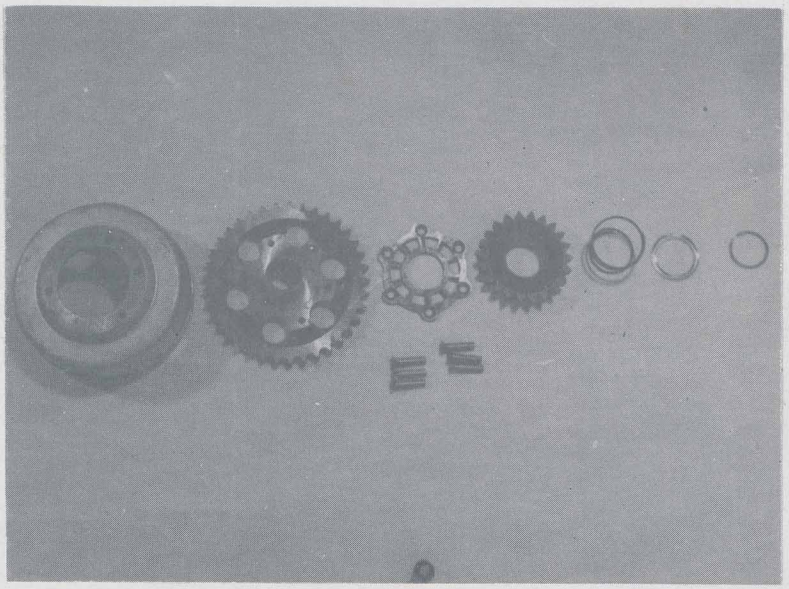
Install kick starter. First put on the spring guide washer, next the spring. Now is the time to replace the o-ring on the shaft if necessary. Grease shaft and install kick shaft. Hook up spring and take one turn clock wise. Push down and lock in place.

Note: You can refer back to tear down pictures, #45 and #46 to refresh your memory.

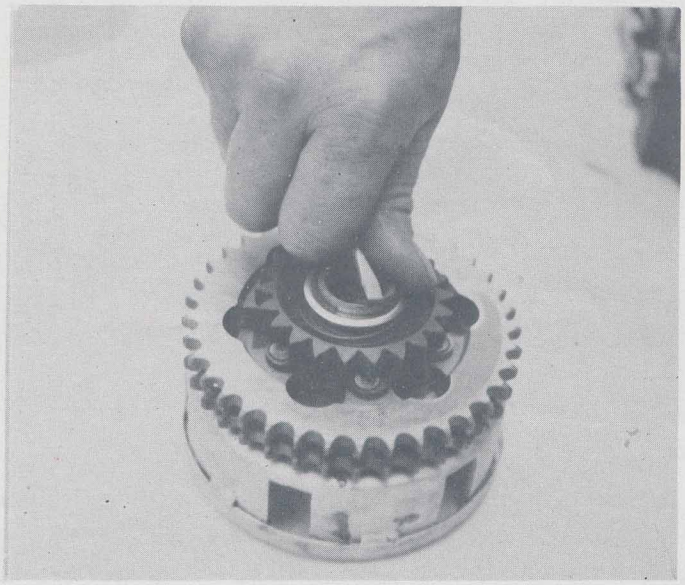


70A

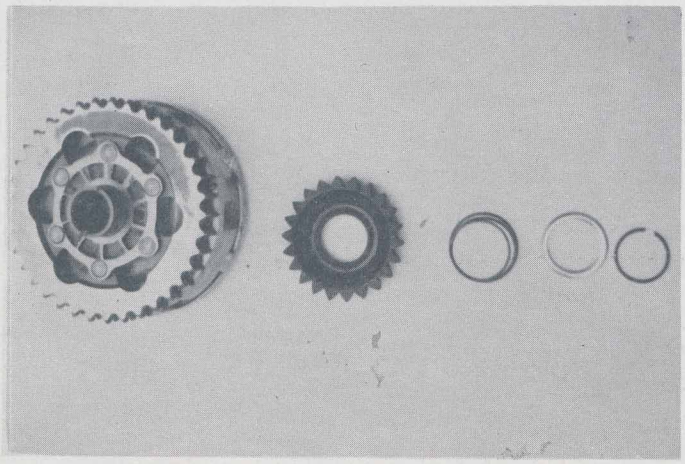
CLUTCH SUB ASSEMBLY



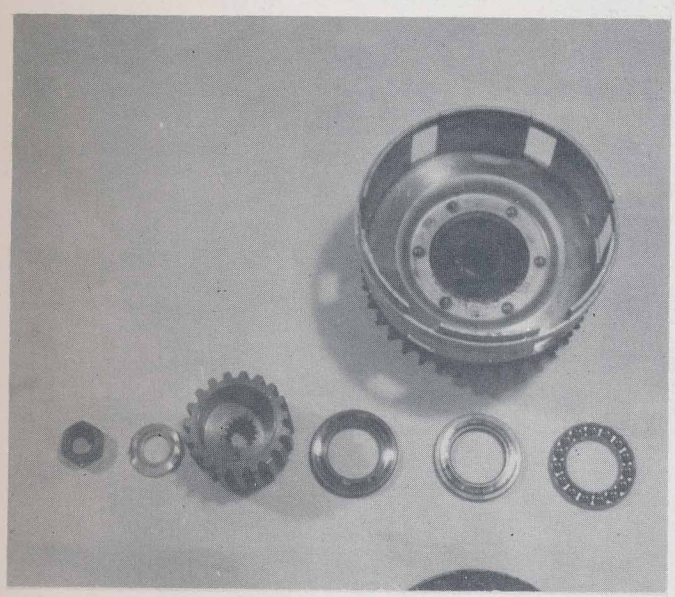
If it is necessary to dismantle clutch to replace housing sprocket or starter disc. First remove snap ring on the end of the sprocket shaft. Remove the spring retainer, spring and kickstarter sprocket.



Next, drill out head of rivet. Replace worn part, and re-assemble. Reverse the procedure.

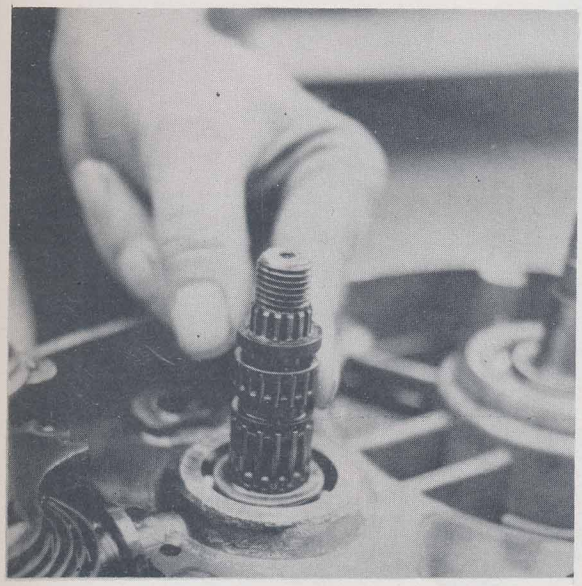


INSTALL CLUTCH

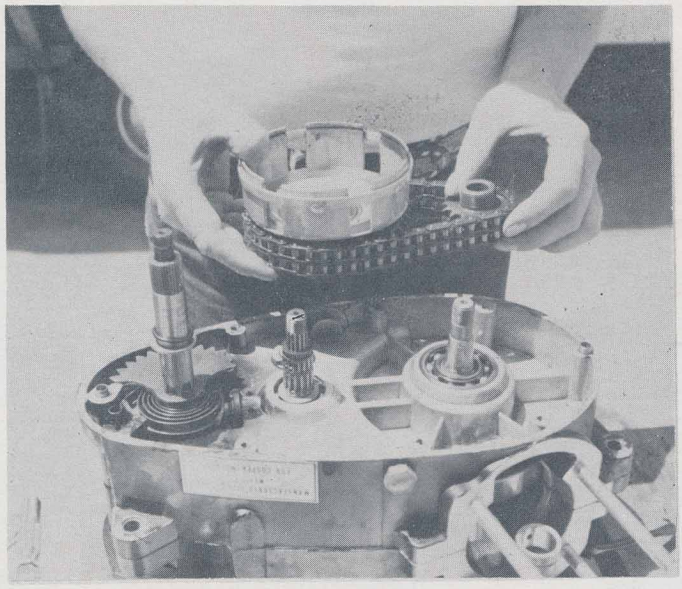


71

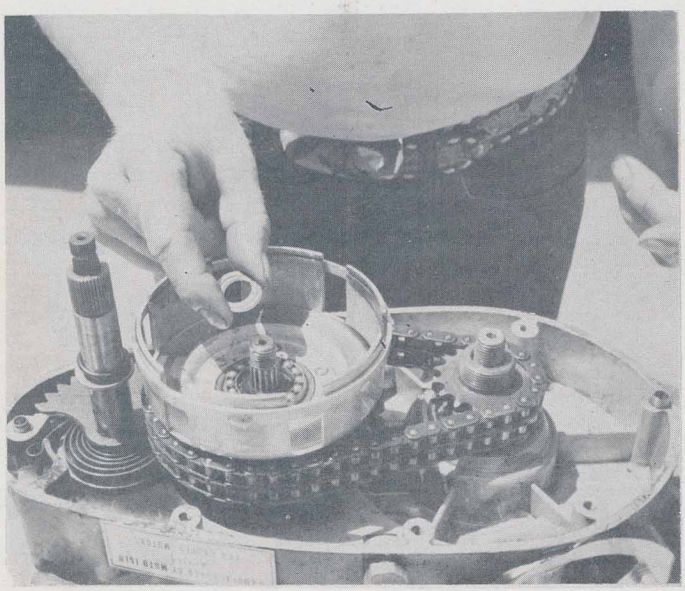
First put the shim spacers on main shaft. Next the larger of the two needle bearings, smaller bearing and spacer adjuster. Note: to check if the shim spacers are correct, it is necessary to install clutch housing, primary chain and drive sprocket. Now, by looking between primary chain and case, you can see if the chain and case are parallel to each other. If the clutch sets low in the back, you add shim spacers. If high, remove shim spacers.
If everything looks good, proceed with the assembly.



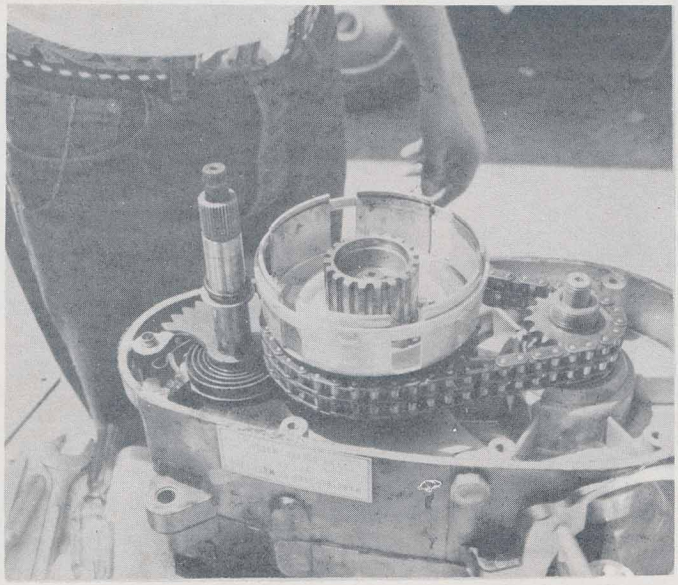
71A



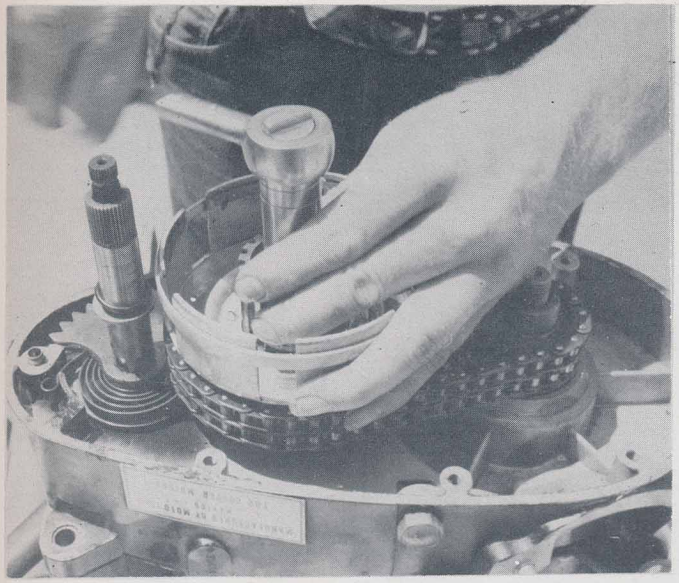
Before installing the clutch and chain assembly, be sure woodruff key is in crankshaft.



Next install caged ball bearing. Note: the shims shown here are to space the clutch body center away from caged ball bearing. To find out if spacing is correct, install body center and tighten L/H thread. If the center gets tight, you need more spacing. If it is free, but you can move the clutch housing up and down, you have it too loose.

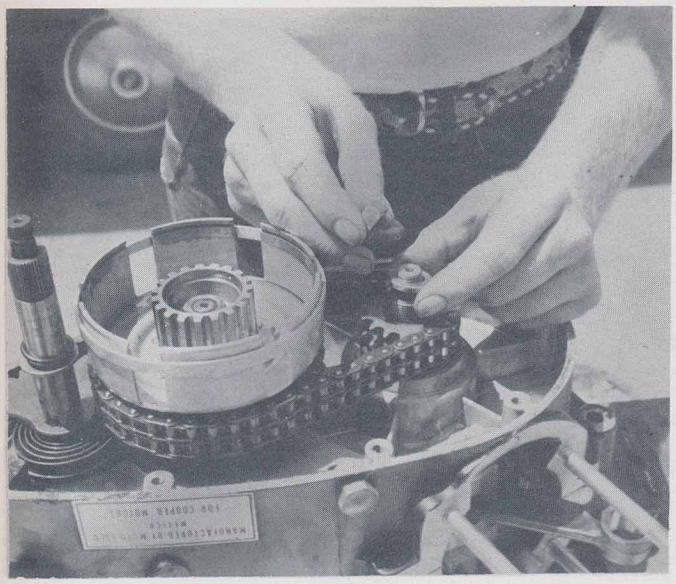


72B



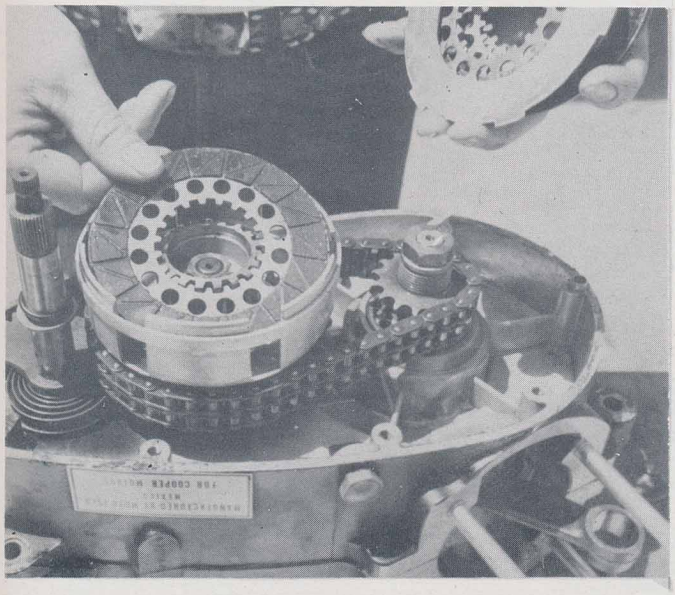
73

Be sure lock washer is in place. Torque nut to 30ft. pounds. You can refer back to tear down pictures #39 & 40 if needed.



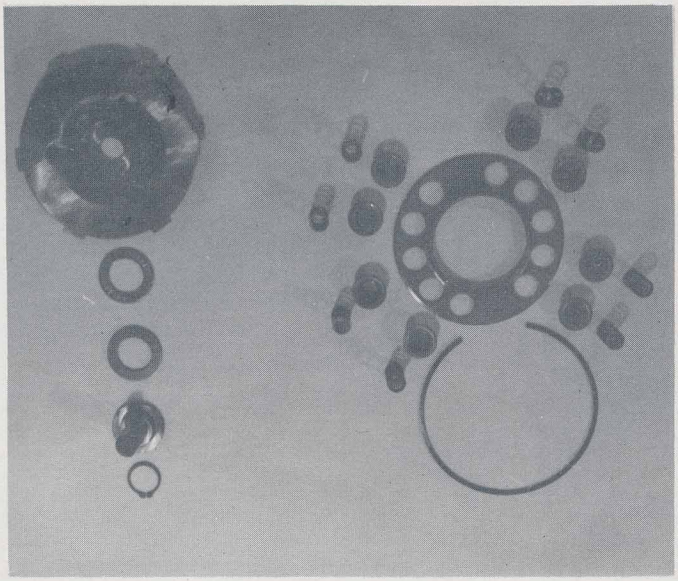
74

Install thick washer and nut on crank shaft. Torque to 40ft. pounds, R/H thread.



75

Next, install plates, starting with a bonded friction plate and then steel, etc. There are 5 friction and 4 steel plates in all.



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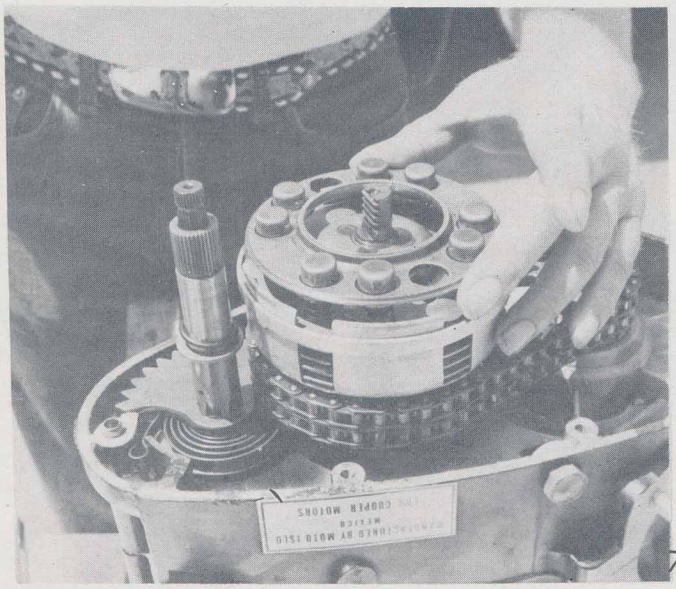
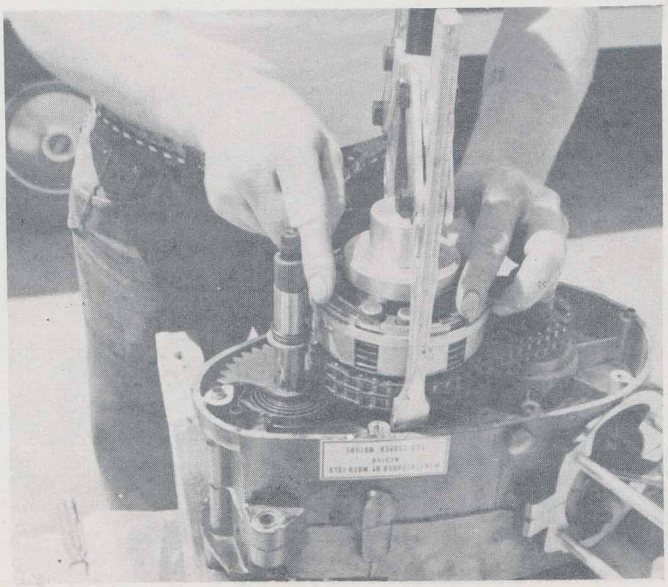


77

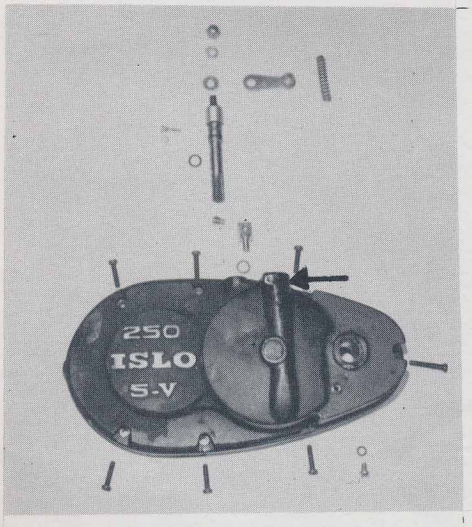
Now install the pressure plate and the terminal spring holding plate. Note: springs (8) and cups (8) shown here is standard. For a heavy duty set up, add 2 more springs and cups.

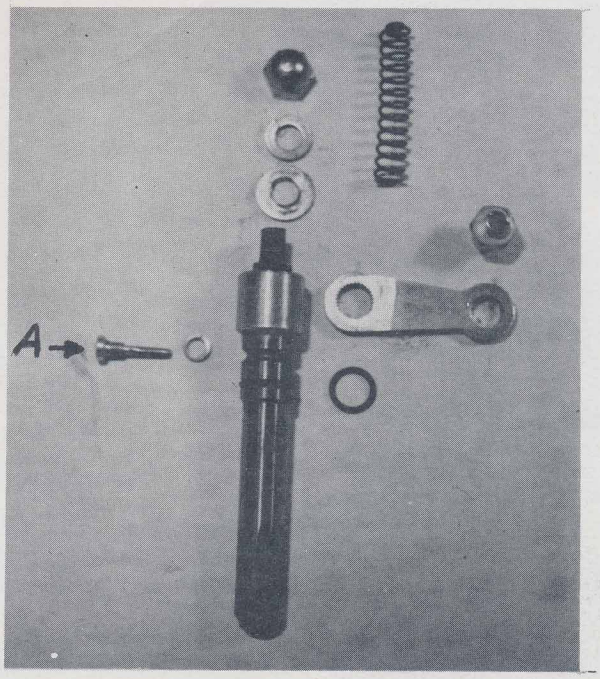


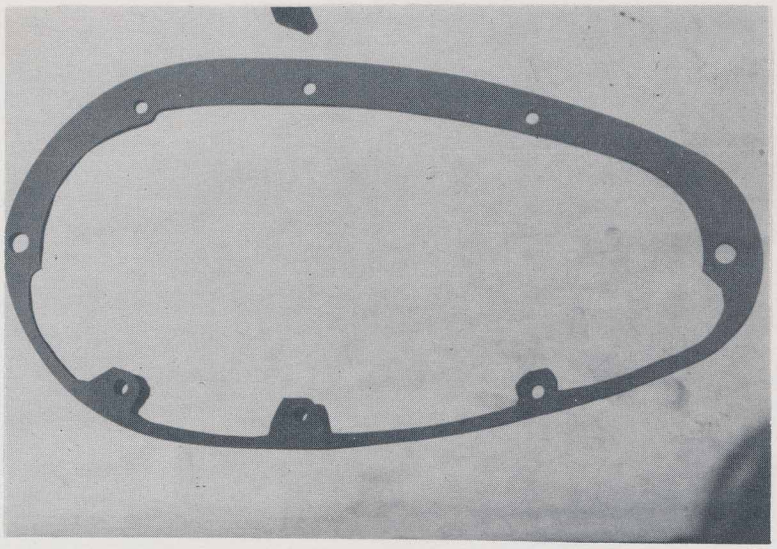
Compress springs and install snap ring.

CLUTCH CASE SUB ASSEMBLY

To replace case bushing, clutch axle spindle or o-ring, you must first remove locking screw "A". Pull spindle up and out. Reverse procedure to assemble.





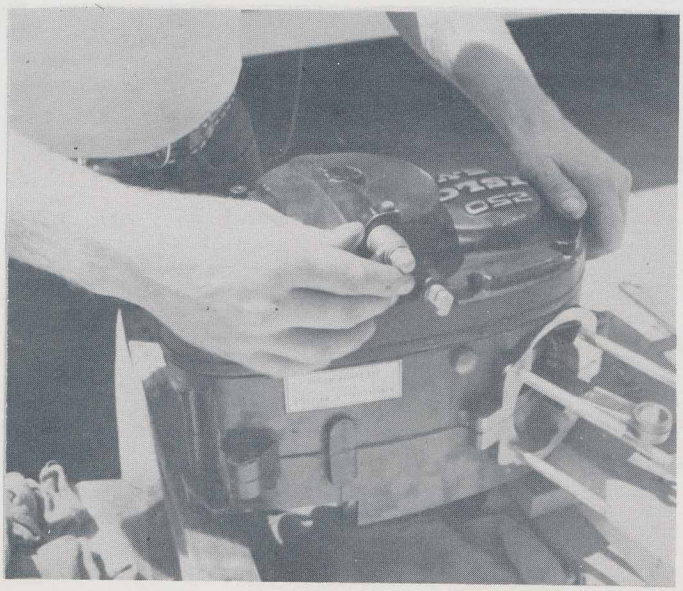


Note: clutch cover gasket has been altered. This has been done so that when you drain oil, you get more of the dirty oil out.

79

Installing cover follows the same procedure as removal. Refer to the pictures #32 & 33. Engage clutch lever spindle with center piece on clutch assy. and pull cases together, by activating lever.

80



80A

CYLINDER AND PISTON SERVICE

Following dismantling procedure 14, 15 & 16, remove rag protecting bottom end and carefully remove base gasket. Recover until reassembly.

1. Decarbonizing

This service always requires that the head, cylinder and piston be removed from engine. Scrape carbon deposits from exhaust port. Use a stout bladed knife, take care not to damage cylinder walls. You can use a fine wire rotor brush and a drill motor to help clean exhaust port and cylinder head cavity. Take care not to scratch cylinder head gasket surface or rough up combustion chamber surface with cleaning tools.

Wire brush or sand off top of piston. To clean carbon from piston ring grooves, use a ring groove scraper or break an old ring in half and use it. Note: Take care not to remove metal when scraping grooves or ring will become loose in grooves and loose its efficiency.

2. Cleaning

Clean all parts in solvent and air blast to dry, or wipe with clean rag. Lightly hone cylinder wall to remove glaze. After honing cylinder walls, wash again in solvent and lubricate cylinder walls.

3. Cylinder and Piston Scores

If cylinder scores remain after clean up honing, it is advisable to re-bore to next size piston. (A light score .001 is o.k., anything over that bore the cylinder.) If piston scoring is deeper than .001" to .002" or the score is wider than ½" replace piston.

4. Measuring Tools

If you don't own a precision micrometers and gauges, go to someone who does. The piston to cylinder wall fit is very important, in a two cycle performance.

5. Measuring Piston & Cylinder for Wear

A. To check piston wear: measure piston diameter at bottom edge of skirt and at right angle to piston pin. Standard piston measures 70mm + or - .0005". If diameter is in excess of .002" of wear, it should be replaced.

B. To check cylinder wear: measure cylinder wall diameter at top and bottom of bore. If taper exceeds .003" it is time to rebore.

C. To check piston to cylinder clearance: Compare piston skirt measurement to the measurement made at bottom of cylinder bore. If differential exceeds .003" try fitting a new piston of the same size. If the piston clearance is within limits, use it. If not, rebore to new piston.

6. Cylinder Boring and Piston Fitting

When re-boring fit new piston to .002" to .0025" max. Note: flat tracking fit .0015" to .002". When boring finish bore .0008" under and hone to final dimension with a cylinder hone, passing hone back and forth in bore to insure a cross hatched finish.

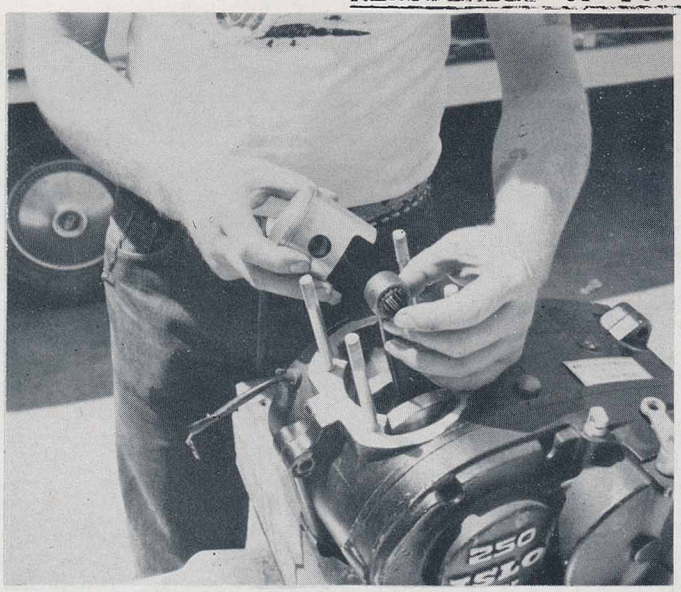
7. Fitting New Rings to Cylinder

Insert new ring into cylinder and square it so it is about ½" down bore. Use feller gauge to measure end gap. Gap specification calls for .011" min. to .014" max.

8. Re-Assemble Per Instruction

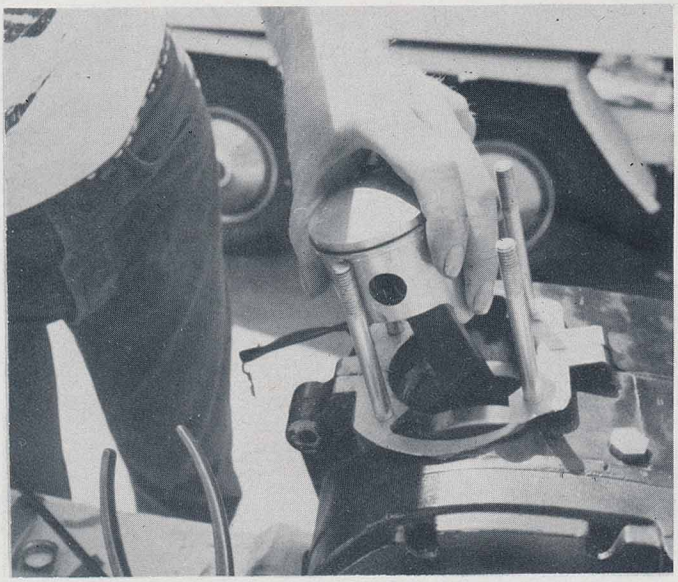
Measure @ piston skirt.

REASSEMBLY OF TOP END



81

First install bearing in rod. Align piston hole with rod and push wrist pin in.
Note: Oil bearing



82

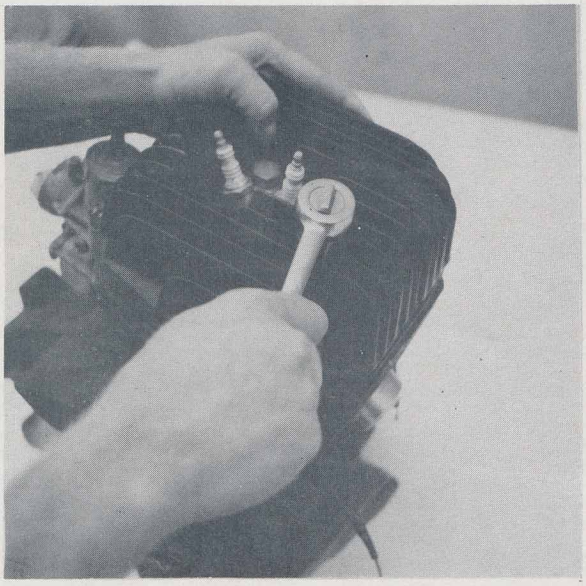
Be sure to install the 2 wrist pin clips.

83

Put base gasket in place and install cylinder. Note: Oil cylinder and squirt a little in bottom end.

84

Put head in place with 4 sleeve bolts and 4 washers. (19mm bolt)
Note: the thick head gasket has a wide area, it goes toward the front exhaust port.



85

Torque head bolt to 40ft. pounds.

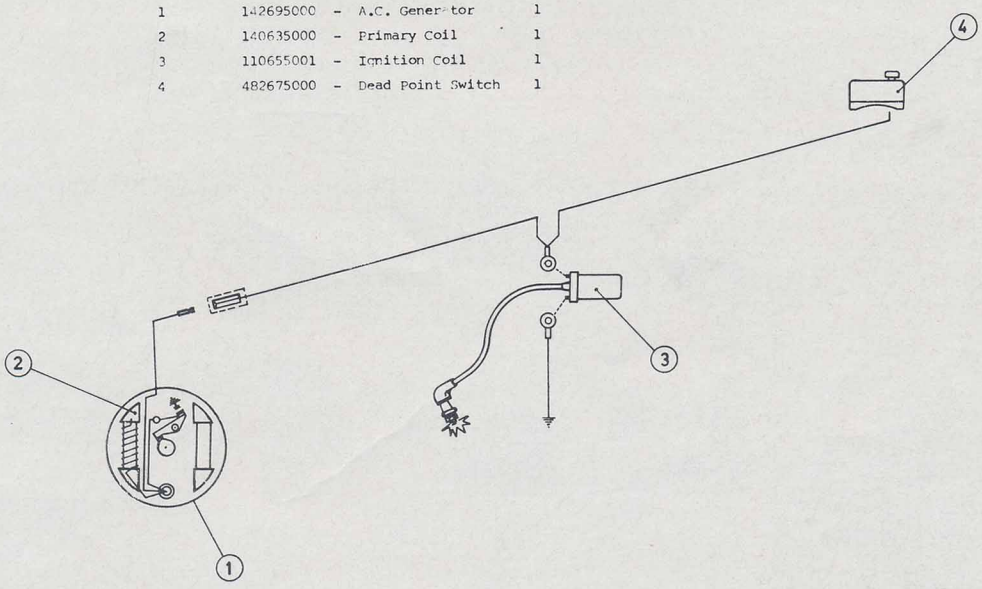
Thanks to Craig Scott

MX 250cc 5-V

ELECTRICAL SYSTEM

The Cooper magneto, for the 5-V Motocross is composed of a condenser, breaker points and primary coil. They are mounted to a die cast alloy frame, which is secured to the engine case. An aluminum flywheel containing cast in permanent manets and mounts on the right hand end of the crank shaft and surrounds the ignition components.

FIG.	No. I.B.M.	DESCRIPTION	QTY.
1	142695000	- A.C. Generator	1
2	140635000	- Primary Coil	1
3	110655001	- Ignition Coil	1
4	482675000	- Dead Point Switch	1



Magneto Wiring Diagram D

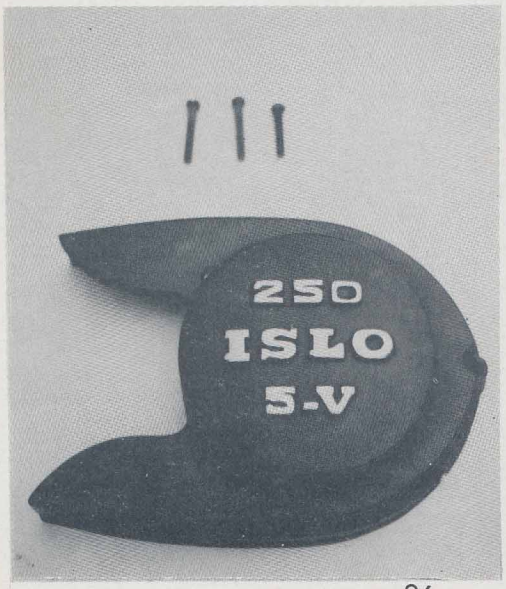
(1) Alloy frame
(2) Primary Coil
(3) Ignition Coil
(4) Kill Switch

IGNITION TIMING

1. First remove mag. cover, 3 screws; 2 long, 1 short 6mm. The short screw goes in front hole. Picture #86.

2. Next rotate flywheel counter clock wise to point where breaker point gap is at its maximum. With a feeler gauge, check gap. Standard gap setting is .012" to .015". When adjustment is necessary, loosen the breaker point screw, adjust and retighten locking screw. Picture #88.

3. Method of timing. Remove center spark plug. Using a dial indicator, find top dead center. (TDC) Set indicator to zero. Next, disconnect red wire of the mag wiring harness. Clip on one lead of a continuity light or OHM meter to it. The other wire from light or meter to ground. Now rotate the flywheel counter clockwise, observing the dial indicator and watch for light to dim or meter indicator needle to move. This indicates point where breaker point opens. The dial indicator should read 2.5mm, ?(Try 1.5mm) two and one half milimeters before top dead center (BTDC).



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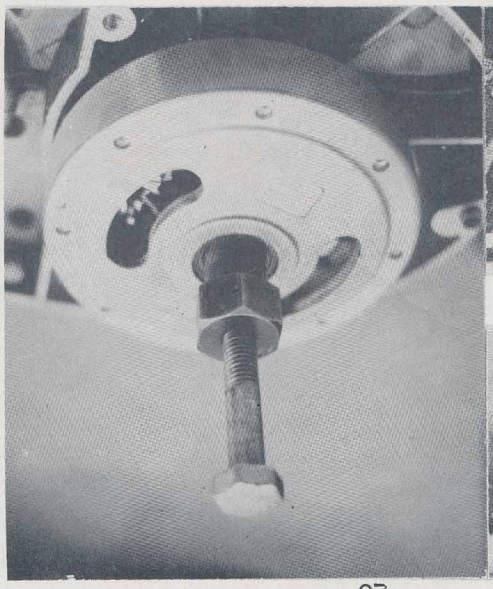

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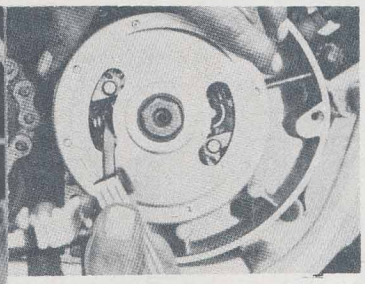

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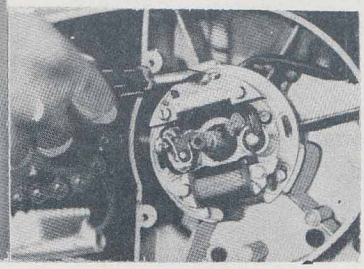


89

Pull flywheel 19mm nut R/H thread and use PWP #100, #87

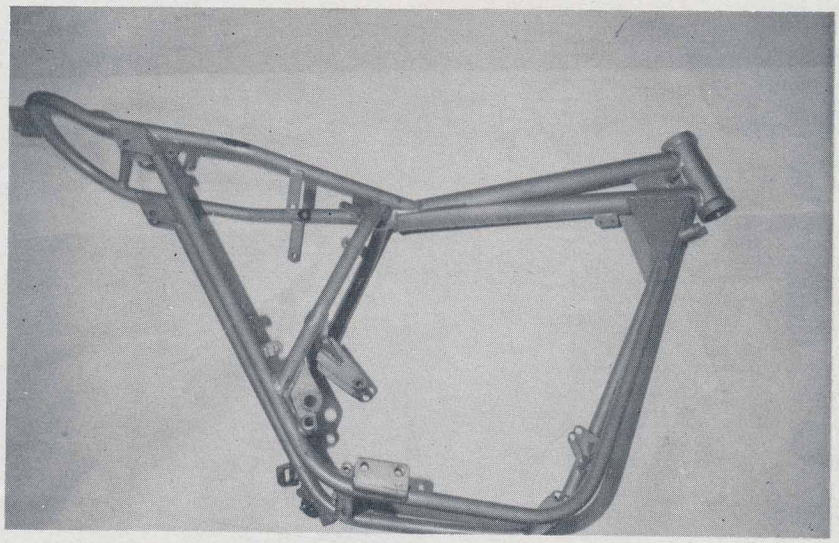
Lubrication While flywheel is off engine, wipe flywheel cam surface with clean rag and smear thin coat of high temperature grease or SAE 10 Wt. Oil on it. Also a few drops of oil on felt piece on backing plate.

To Adjust Prior to adjustment, file and clean point. To adjust, loosen mag backing plate locking screws (3) per picture #89; moving the plate clockwise will advance the timing. Reverse to retard. After performing this procedure, install flywheel permanently. Re-check timing; it may be necessary to move breaker point to get right on 2.5mm. Just set dial indicator right on 2.5mm and adjust point while watching light or meter.

FRAME AND SUSPENSION COMPONENTS

The frame is fabricated from 13 gauge, 7/8" O.D. 4130 chromoly steel tubing and is arc welded, normalized, shock stress relieved, degreased and spray enameled. Frame design provides maximum strength. For engine mounting as well as suspension mounting this frame provides the ultimate in stability and ease of handling. Note: The frame should be carefully inspected at regular intervals for breaks or fractures and especially after prolonged use in rough country or on a moto cross track.

Should the frame be twisted or seriously broken, it should be replaced, as no jigs are available to properly re-align a damaged frame.

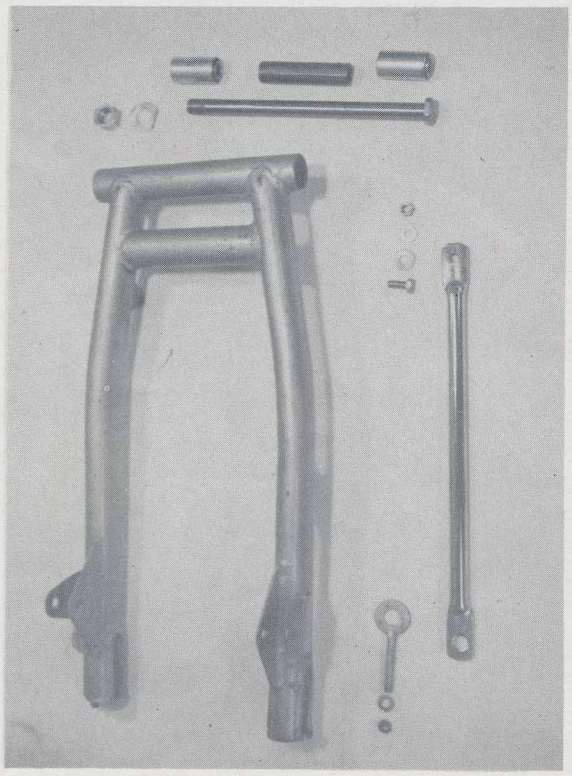


90

SWINGING ARM & REAR SUSPENSION

The swing arm assembly is composed of a tubular steel, and the assembly pivot mounted to the frame and suspended at the open ends by upper frame mounted shock absorbers. The swing arm bushings are constructed of two steel tubings, vulcanized together. They are pressed into the swing arm with a spacer between them.

The oil damped single action shock absorbers (Boge by name) are equipped with 80lb. progressively wound coil springs, and are rubber bushed mounted.



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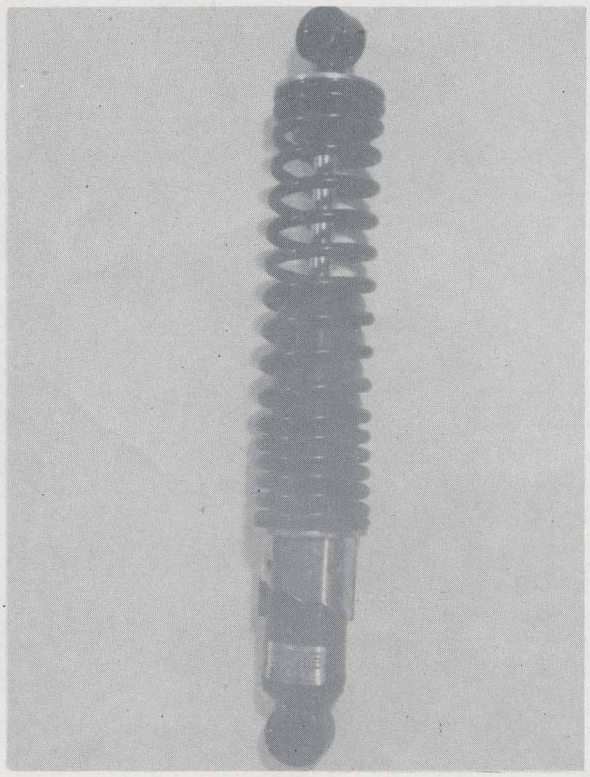


92

SERVICE ON SWING ARM & SHOCK

The swing arm bushings will wear out in about 5,000 to 6,000 miles under competition use.

To replace bushings, take a torch and burn out the rubber. After the centers are out, it will be necessary to take a pointed punch and drive it between the outer bushing and swing arm, bending it in and folding it so it can be pulled out.

After replacing bushings it will be necessary to sand and repaint swing arm.

Check alignment of swing arm with straightedge and also by measuring free height (with shock and rear wheel removed) between the top and bottom shock mounts on both sides. The measurements should be the same. If bent, find out what side is the lower, then replace the shock on the straight side. Now by taking a long bar, laying it over the arm on shock side, and under the low side, you can re-align by prying low side up.

Note: Shock absorbers are designed as throw-aways; if unit leaks replace.

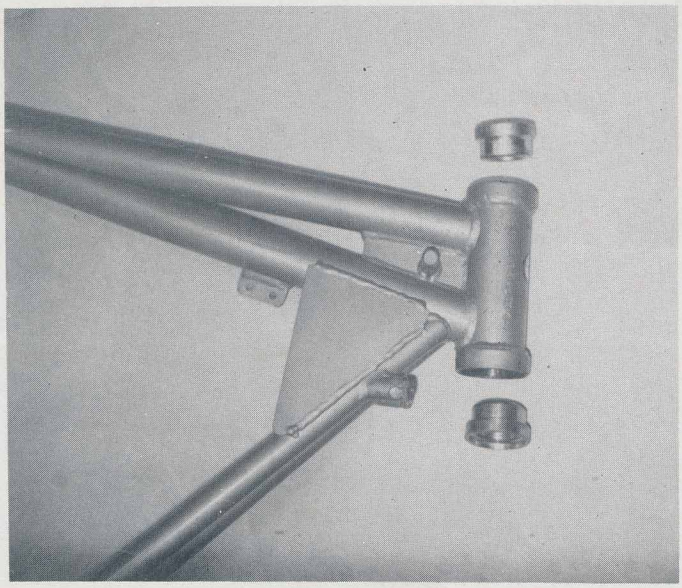
Note: When removing swing arm pivot bolt, be sure to first take the nut from the end of shaft, and then the pivot bolt must be unscrewed from the frame. Do not try to remove the pivot bolt by force, it must first be unscrewed from the right side of frame.

STEERING HEAD BEARING ASSY.

&

HANDLEBAR MOUNTS

The steering head bearing assembly consists of cadmium plated, machined steel inner and outer bearing races seperated by uncaged ball bearings located at either end of the frame steering head support tube. The steering stem is centered by the inner bearing races and bearing play is adjusted by tightening the threaded top inner race onto the steering stem. Once adjusted, a notched jam nut (between bridge fork top and top race) locks the top race in position. The cast alloy bridge fork top is fastened atop of the stem by a large hex nut. The handlebar mounts to bridge fork top by 4 alloy clamping pieces and 4 bolts. Note: Use a light grade water proof wheel bearing grease to lubricate bearings.



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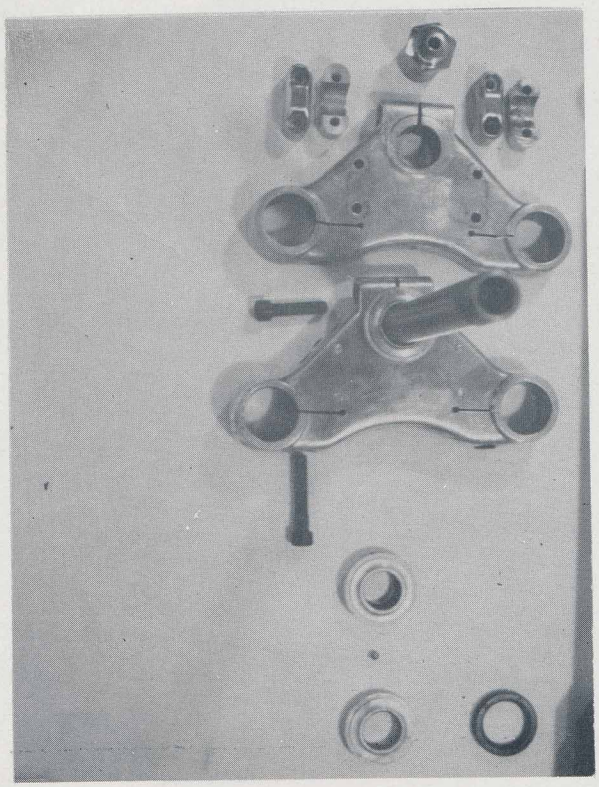


94

TELESCOPIC FORK

The Betor Telescopic action front fork assembly consists of a pair of centerless ground steel inner tubes which are clamped to the steering head assembly. A pair of outer slider tubes (legs) bracketed on the bottom ends to receive the front axle shaft. They operate up and down over the inner tubes.

At the top of the slider tube you will find the oil seal, pressed in and held by a snap ring. A dampening unit is used to control the spring return of the slider. The dampening unit installs into the inner tube at the bottom and is secured by a snap ring. The outer slider tube is connected to the dampening unit by installing the inner tube into the slider. From the bottom of the slider thru the hole, install the allen bolt.

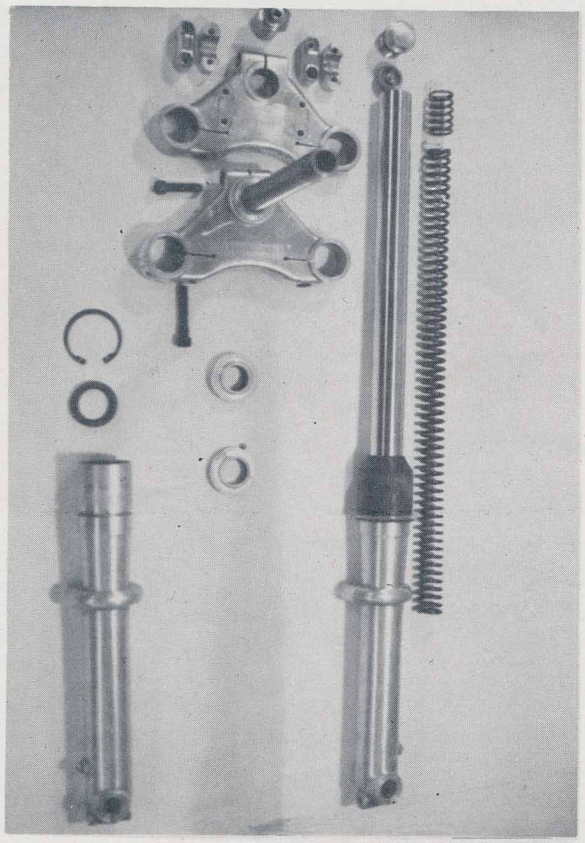
The slider tubes contain an oil supply used to lubricate, and in conjunction with dampening units, dampen fork action. 6½oz. per leg of 10-20 or 30wt. fork oil. The weight of oil will depend on temperature and spring weight. (Example: Cold weather 10wt oil, cold weather H.D. Springs 20wt. oil)

The springs are a straight wind 17lb. rate. The spring installs into the inner tube and mounts between the top of the dampening unit and a breather valve and nut.

A hydraulic dampening effect to aid the springs in arresting the outer slider tube is provided by the dampening unit inside the bottom end of the slider tube. The orificing of oil thru the dampening unit allows progressively less oil from the outer slider tube reservoirs to escape into the inner tube thru its orifices.

A rebound hydraulic dampening stroke is effected as oil trapped between the inner and outer tubes is forced back through the orifices by the spring return of outer slider tube.

TELESCOPIC FORK & CROWN SUB-ASSEMBLY



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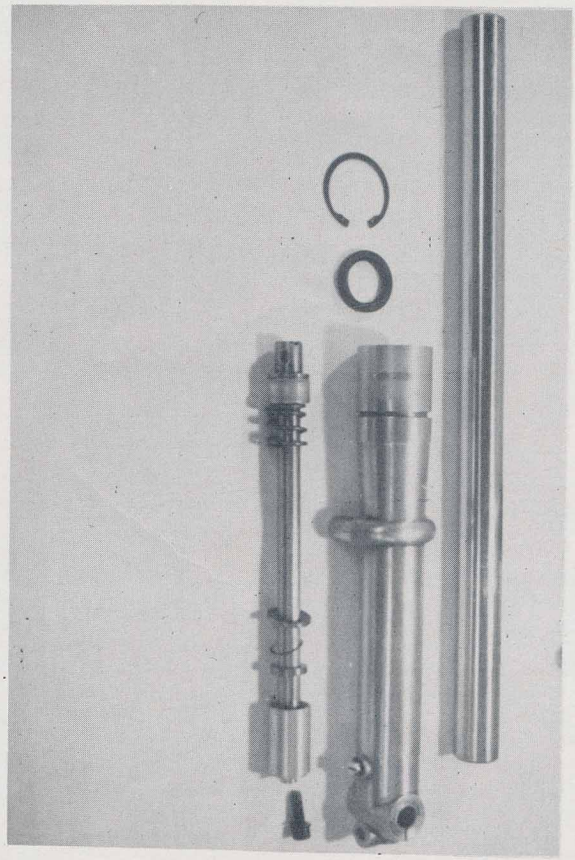


96

WHEELS

The front and rear hubs are built up from die cast alloy. The spokes are 8 gauge spring steel.

The rims are steel 21" front and 18" rear. Thirty-six (36) spokes are installed on a two-tangent basis, or in other words each spoke crosses two spokes from the same flange between hub and rim.

Wheel bearings are of the ball bearing type and a distance collar employed between the bearings prevent side loading on the bearings when the axle assembly is fully tight. This also serves to eliminate wheel end play.

Things to check for:

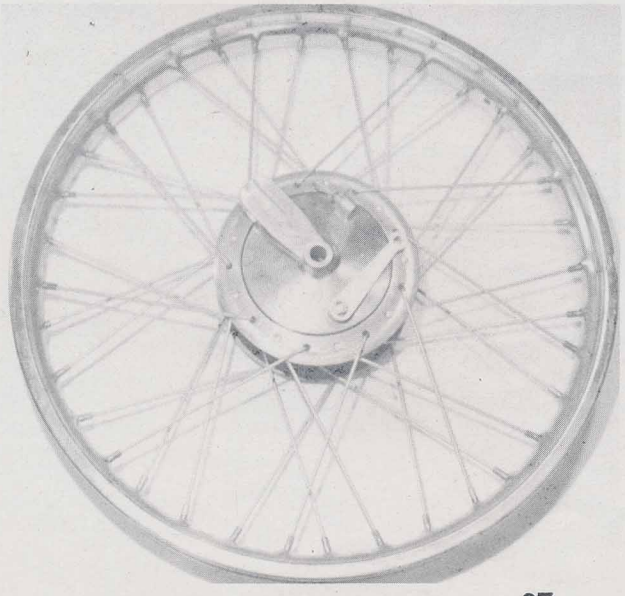
Check spoke tension at regular intervals. Once tension is lost, the rolling action of the wheel working on the loose spokes will loosen additional spokes and if left unchecked, will ultimately collapse.

Check bearings--block up cycle so wheel being inspected is clear of the ground. Check bearings by grasping the tire from the side at the top and bottom. Push and pull in opposite directions with hands. Any distinct sideway motion indicates a worn set of bearings.

To remove bearings from hub, use a long punch reach thru one bearing and drive out the opposite side bearing.

Note: distance collar must go back between the two new bearings.

Front Wheel Assy.



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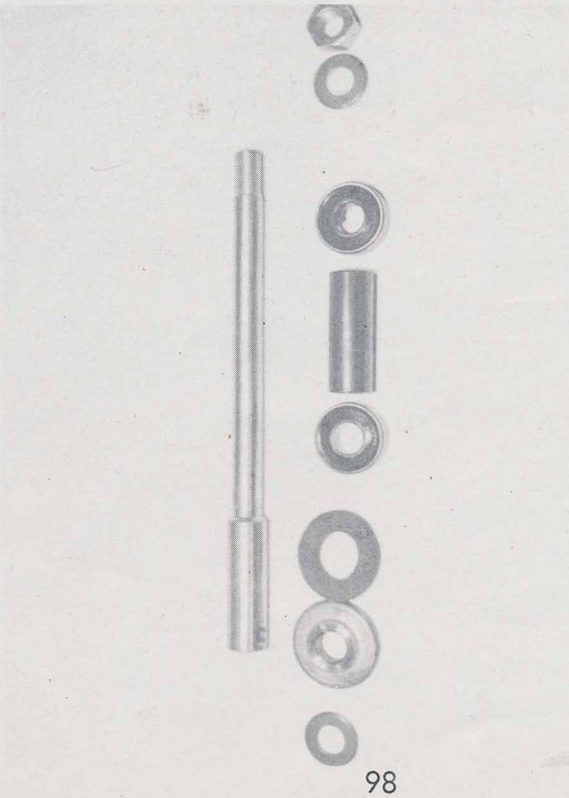
Front Wheel Axle Assy.



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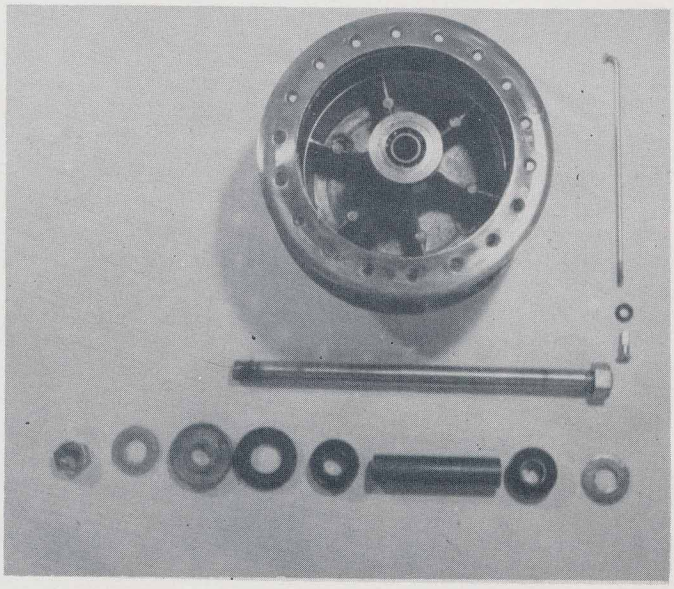
Rear Wheel Assy.

99

Rear Wheel Drum & Bearing Assy.



100

BRAKES

1. Service brakes. Jack up the motorcycle and remove wheel. Note: the important position of spacers and dust seals for re-assembly.

2. Clean inner surface of the brake drum with solvent and blow or wipe dry.

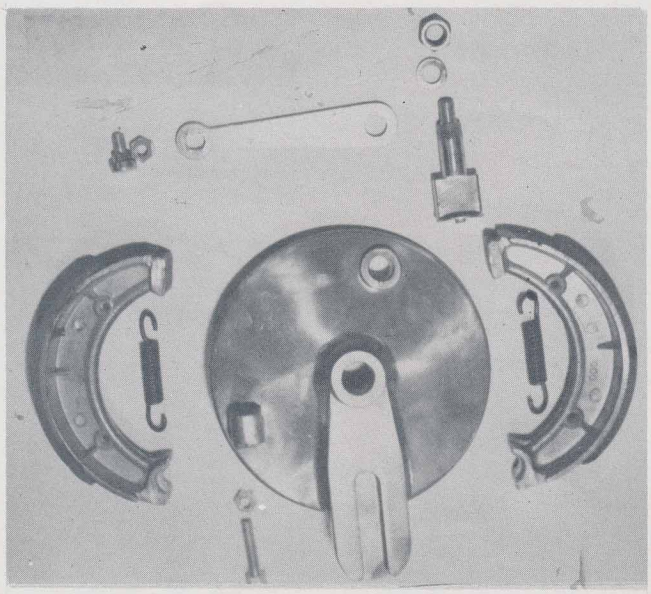
3. Disassembling backing plate. Spread apart one end of brake shoes (post end) and fold off. Clean and examine backing plate casting. Replace if cracked or fractured. Check if cam shaft rotates freely in backing plate passage. If not, remove and lightly sandpaper both shaft and passage. Inspect cam, cam shaft and lever splines. Replace if worn or broken.

4. Clean and inspect Brake shoes. Check lining condition, and if less than 1/16" lining material remains on shoe (measured at the thinnest point) replace with new shoes. If the linings appear to be o.k., clean shoes with alcohol or lacquer thinner. Then sand off any glaze and re-install shoes.

Re-assemble backing plate. Lubricate cam shaft and brake shoe pivot point. Re-assemble brake shoes onto backing plate. Place both shoes side by side with lining facing up, pivot point of shoes together facing down. Hook both springs in their proper holes. Pick everything up together and place cam face of shoe over cam, pivot over pivot post and pry apart so shoe will snap into place on backing plate.

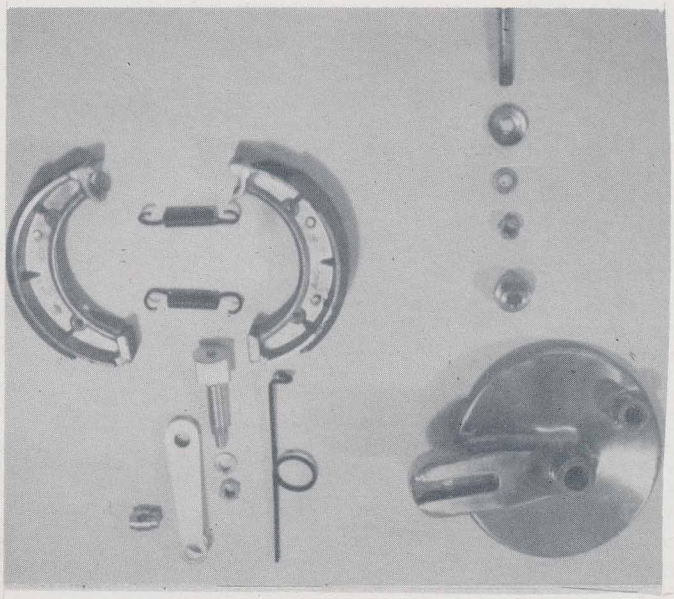
Note: Front and rear shoes are interchangeable.

Front Brake Assy.



101

Rear Brake Assy.

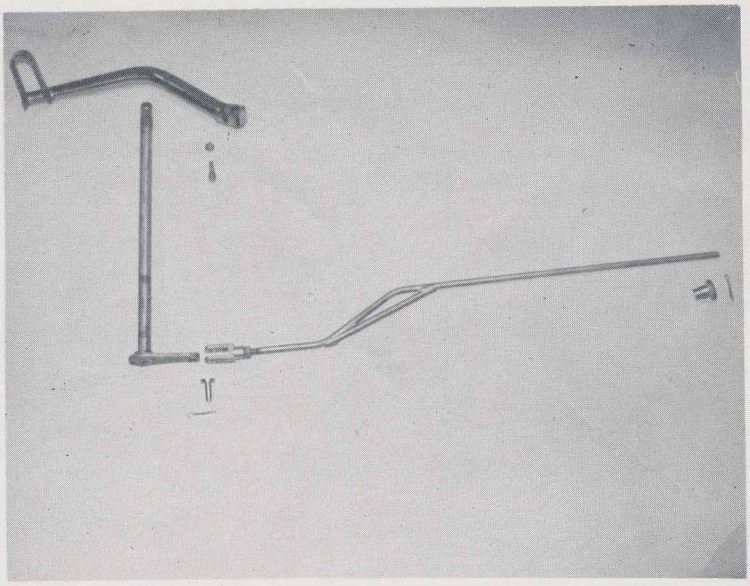


102

BRAKE PEDAL ASSEMBLY

The foot operated rear brake pedal is mounted to the frame by means of two hollow sleeves, one welded on each side of the frame. The brake shaft slides thru the hollow sleeves from left to right, and is secured by a welded-on arm, on one side and the pedal itself on the other.

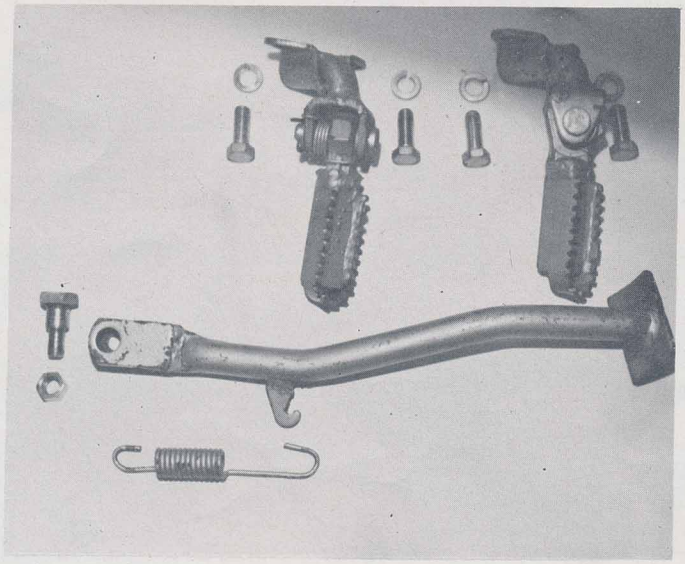
Brake rod runs from brake shaft arm to rear wheel backing plate lever. The pedal return spring is incorporated with the backing plate and lever. (Note: Adding another return spring is helpful.)



103

FOOTREST ASSEMBLY

The competition approved folding footrests are bolt mounted to frame. (Note: newer models, base piece is welded to frame.) The folding bar is serrated for a better grip, and its folding angle prevents digging in.



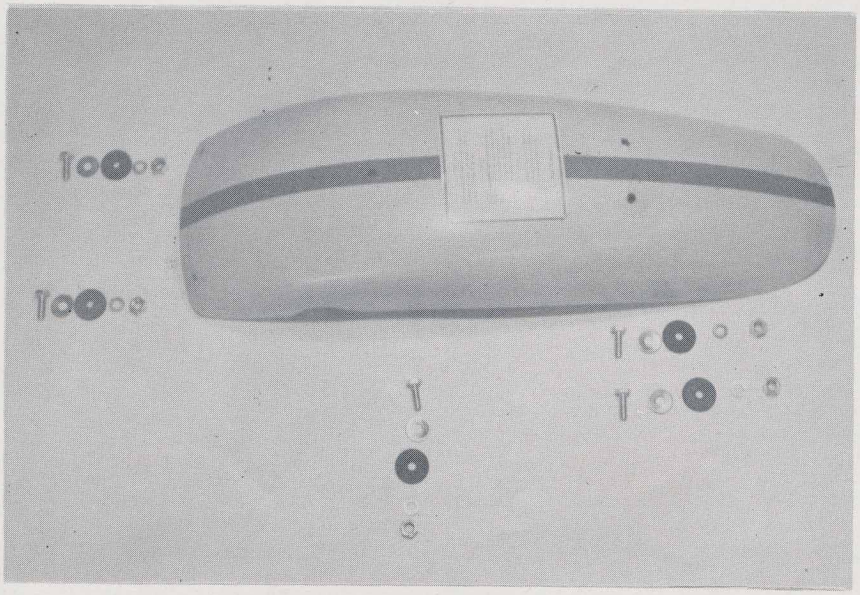
104

SIDE STAND

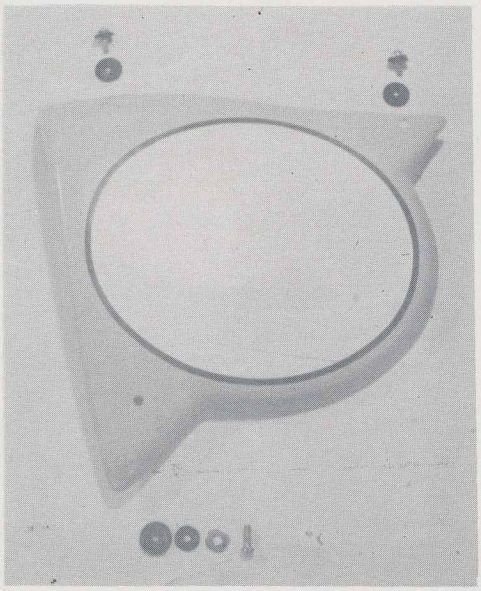
The folding side stand is equipped with a tensioning spring to hold it in the selected position.

FENDERS AND PANELS

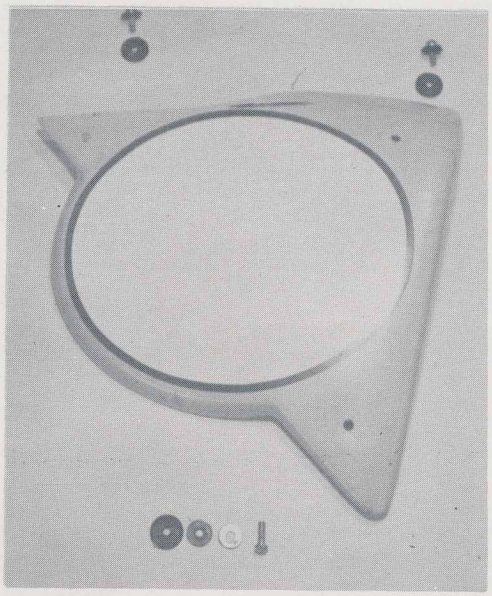
The Cooper fenders are fabricated of fiberglass; the same as the side panels. The reason for this is that they help keep the bike as light as possible.
Note: Check the fender mounting bolts and panel screws for tightness at regular intervals.



105



105A



105B

STANDARD FACTORY PORT SPECIFICATIONS

	TOP	BOTTOM
Exhaust	34	64
Back Transfer Port	51	67.5
Back Transfer Port	51	67.5
Front Transfer Port	51	64
Front Transfer Port	51	64
Intake	71.5	100

Measurements For Enduro Model

Exhaust	36	64
Back Transfer Port	51	66.5
Back Transfer Port	51	66.5
Front Transfer Port	51	64
Front Transfer Port	51	64
Intake	71.2	97.2

Standard Porting Specs. All measurements taken from top of cylinder to each port is in milimeters, with a plus (+) or minus (-) of 0.5.

COOPER MX 250 FIVE SPEED

STOCK ENGINE PORT TIMING IN DEGREES

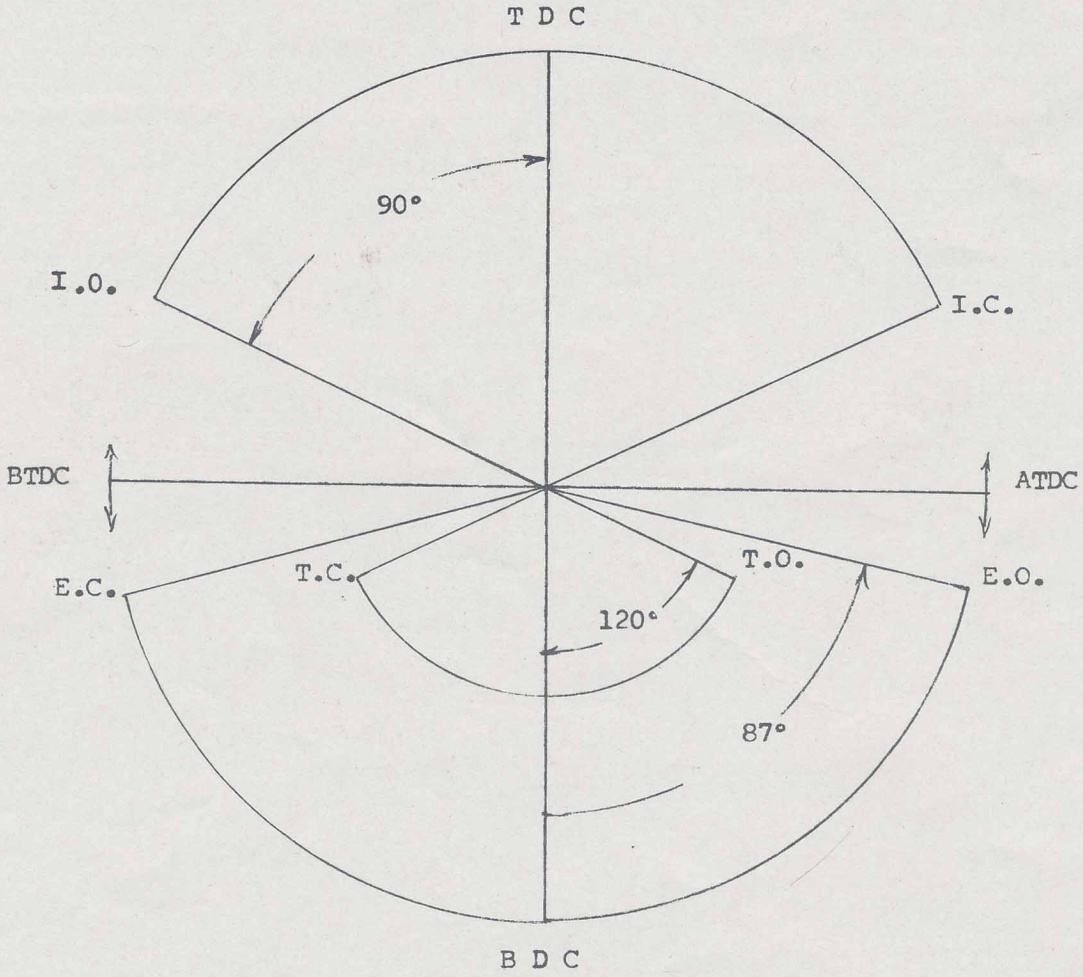


DIAGRAM (E)

DEGREE WHEEL SPECIFICATIONS

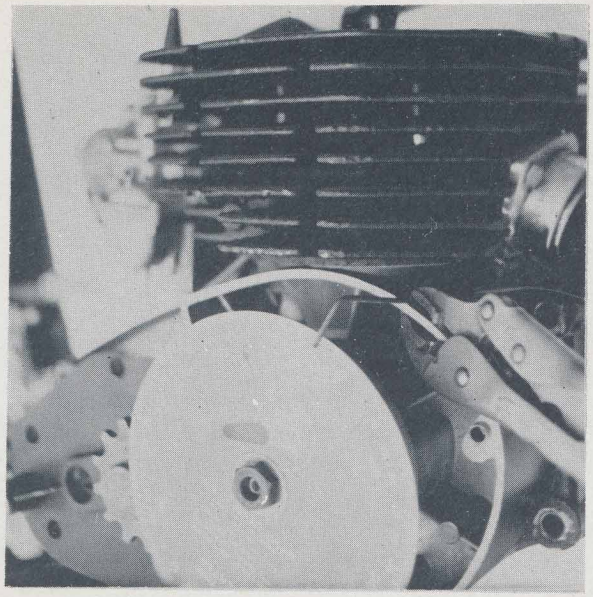
(or how your engine should read out)

1. Pull head, carburetor and exhaust pipe off engine.
2. Fix a degree wheel to mag side of crankshaft. Set up a pointer wire. Now bring piston to top and set pointer on top dead center zero. This is not an accurate T.D.C. To get an accurate reading, you will have to fix a piston stop. (A bent piece of metal that can be bolted to the cylinder and sticks into the bore to stop the piston from reaching the top.)

For example, say the pointer is reading 84° B.T.D.C. against stop. Now turn engine counter clockwise until it comes against stop. It could read 85° A.T.D.C. Take ½ a degree from 85° by bending pointer wire. Now it reads 84½° A.T.D.C. Rotate crank back to the original setting, it now should read 84½° B.T.D.C. Remove piston stop and bring piston to top. The pointer should read T.D.C. zero.

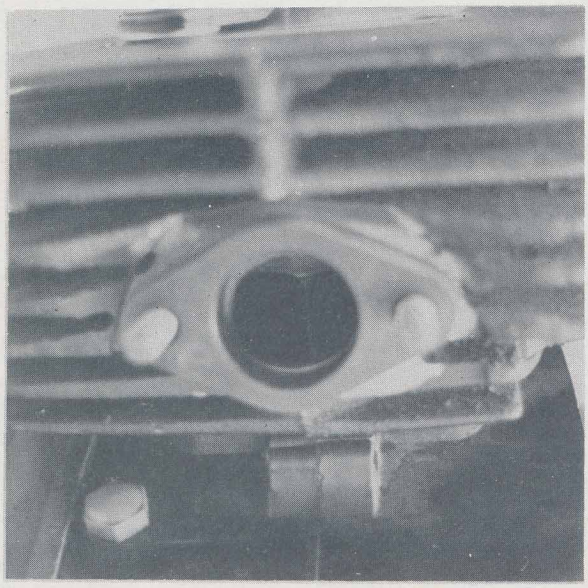
3. Check out your engine's port timing, "Zero out T.D.C.". First intake opening. Look into intake port and rotate engine counter clockwise till skirt of piston just meets with the bottom of the intake port. The reading B.T.D.C. should be 90°. Rotate clockwise past T.D.C and watch for top of piston to open exhaust port. When the top edge of piston and top edge of port are aligned, it should read 87° opening A.T.D.C.

Note: a good way of seeing the alignment is to shine a light in the exhaust port and watch for piston to clear. Turn a little further clockwise and watch for transfer to open. When top of piston and top edge of port align it should read 120° A.T.D.C.



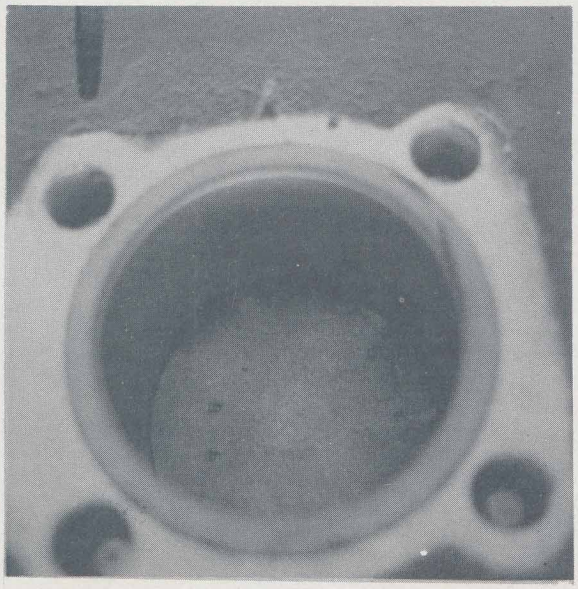
106

Setting up an accurate degree wheel reading is most important.



107

Looking into intake port.



108

Looking down bore at exhaust port and transfer ports.

RACE PREPARATION --- ENGINE

1. Weight
There is a lot of weight that can be taken off the engine cases. Example: The mag cover. you can cut the ears off of that extension back from the main housing over the counter sprocket. Also cut flanges and boss's off of main cases. You can drill the cylinder and head. Every little bit helps.

2. Carburetor
A 34mm Mikuni, either a VM34-8 flange mount or VM 34-20 spigot mount carb. will pick up performance of a MX or an Enduro.

3. Exhaust Pipe
We have a race proven expansion chamber, P.E.P. by name. Used in connection with a 34mm carb., it hauls. (moto cross only)

4. Piston Cutting
We have found that a 90° intake opening is radical for a beginning rider. To change the timing, it will take a different piston. Example: The stock Cooper piston, measuring from the top edge of the crown to the bottom edge of the skirt, on the intake side measures 68mm. Using a 68mm longer skirt, it will lower the port timing from 90° to about 82°. Beginner riders like this because you get better low end torque.
The Yamaha DT-1 piston can be used if you take 4mm off both skirts and bevel the corner 45 degrees. Over all length of piston should then be 68 mm.

5. Degree Porting
The following specifications are race tested. (Enduro & desert.)

Intake open	82°	Mild----	84°	Hotter	BTDC
Exhaust open	87°	Mild----	85°	Hotter	ATDC
Trans. open	120°	Mild----	118°	Hotter	ATDC

Moto Cross , T.T., and Short Track

Intake open	85°	Mild----	86°	Hot	88°	Hotter
Exhaust open	82°	Mild----	80°	Hot	80°	Hotter
Trans. open	118°	Mild----	117°	Hot	116°	Hotter

Thanks to Craig Scott

PORTING SPECS.

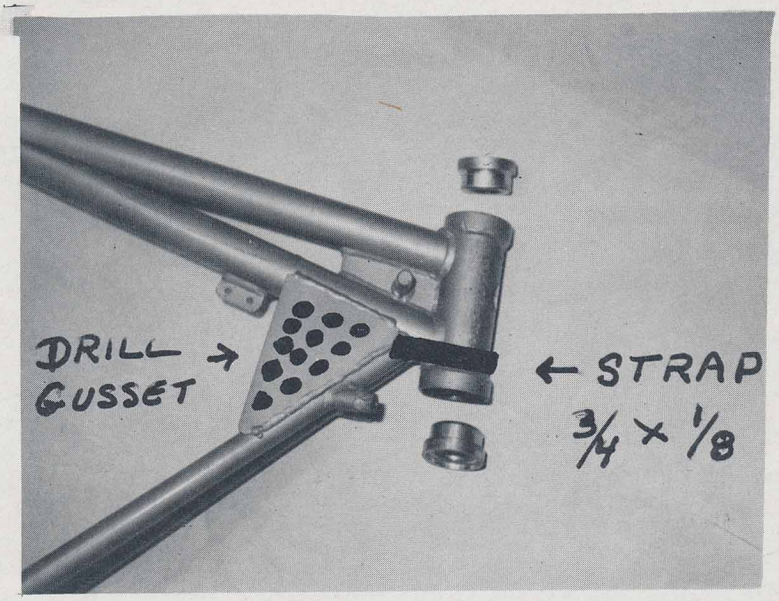
Note: When raising transfer ports be sure the back transfer port opens just a little before the front, about a 4% lead. This means if you're grinding for 116° the back port should start opening at 116° and the rest follow on a 4% decline.

It is not necessary to grind exhaust port at first to try different port timings. If you do want to experiment with exhaust timing, use your stock Cooper piston or a Yamaha MX piston. By setting the degree wheel to what specifications you want, you can reach in the exhaust port and scribe the top edge of the piston. Remove the piston and file the crown flat from the center to the scribe line. Re-install and check to see if you achieved the degree you wanted. Using this method, you can see what port time suits you. On the other hand, if you grind your port out, your're stuck with it.

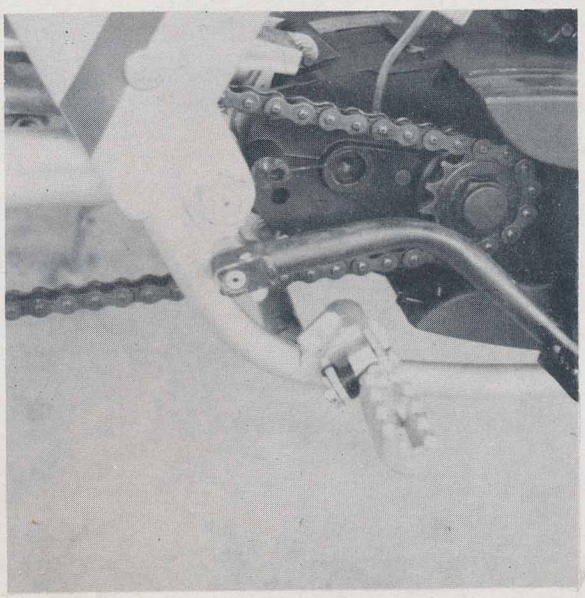
Note: you will have to grind the exhaust port to raise the opening time if you're going to run a dykes ring type piston, as there is not enough material between the ring and the top of this type of piston.

FRAME PREPARATION

1. Strap Steering Head. A 3/4 x 1/8 mild steel strap bent around steering head and welded in place, will eliminate any seperation in this area from repeatted hard landings. Note: be sure not to cover frame numbers.
2. Gussets & Tabs. To help cut weight you can drill out gussets and cut off tabs not being used to hold something.
3. Keep Weight Down. By using plastic fenders, gas tank and air box, considerable weight can be saved. Going along with this, things like D.I.D. alloy rims, plastic lever assemblies and twist grips all help. The lighter the bike, the better it flys.
4. Those of you who have break pedals that go under the pegs can change them easily by cutting off the front toe piece. Turnover the lever, bend to tuck in and weld the toe piece back on.



109



110

TROUBLE SHOOTING FOR ENGINE & ELECTRICAL

Should any trouble be experienced, the following information will help you discover it and hopefully put it right.

1. Engine fails to start. First check for spark. If you have it, check the following: fuel tap closed; no fuel in tank; vent hole in tank blocked; fuel lines blocked; dirty carburetor or water in carburetor; jet blocked; dirty points; water in ignition; spark plug sooted up; spark plug oiled up; electrode bridged; wrong gap in plug. The spark plug gap is .024" to .025".

2. No spark at plug. First clean point, file and wipe clean. Re-check for spark. Take a small instrument bulb, 6-volt, and its receptacle. Hook one wire to the ignition wire (red) coming out of the case. The other wire goes to ground, kick engine over. If light lights, we know that the primary coil is good.

Two things can be wrong. (1) The main coil under the tank is bad or (2) the condensor is shot. While both wires are still connected, kick engine over and watch bulb. If it snaps bright with each kick, more than likely the condensor is good. If the bulb just glows (yellowish color) the condensor is bad.

If the condensor checks good, you can be sure the main coil is bad. In any case, have the main coil checked. The main coil should be checked with a coil tester (an automotive checker is OK). If there is not a checker available, you can make a mickey mouse checker with a 12-volt battery.

Disconnect the hot lead wire from the coil. (Marked "R" on coil.) Take the spark plug wire and a new plug . Tape it to the frame or jam it in someplace where it will ground out. Now take the battery, hook a ground wire from the frame to (-) negative post of the battery. Fix a wire to the (+) positive post of the battery that will reach to the coil. Take this hot wire and just strike the "R" terminal on coil. The plug should spark. Repeat this for 4 or 5 times, just to be sure that coil wants to spark.

DO NOT HOLD WIRE TO POST--IT WILL BURN COIL OUT

If it sparks 1 or 2 times and quits, the coil is bad. If it sparks, no matter how many times you strike it, it is OK. If we are getting juice from the primary coil and the main coil checks OK, then the condensor should be replaced.

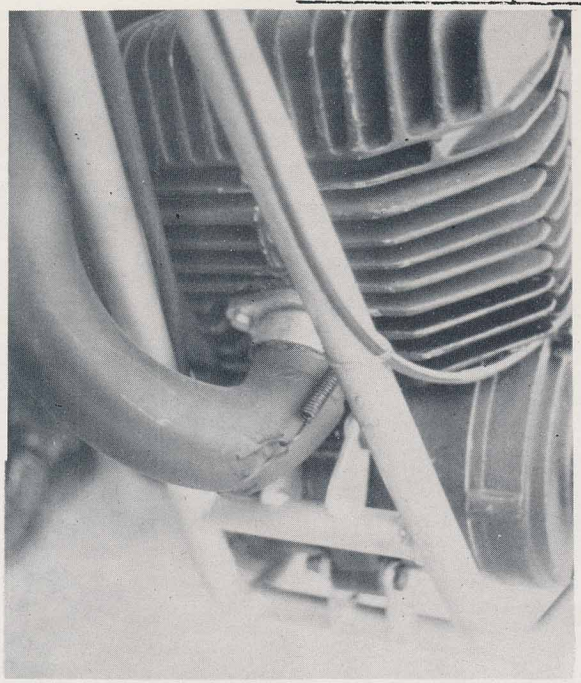
3. The Engine Runs Unevenly and/or Stalls. Engine is not receiving enough fuel, the fuel line may be blocked; carburetor or jet is dirty; engine receiving too much fuel; carburetor is flooding; float needle sticking; spark plug is loose; plug is defective; wire loose at terminals; contact breaker point is oiled or dirty; point is sticking; point gap is incorrect; air filter blocked; check vent in tank.

4. Engine Four-Strokes. Float needle sticks in carburetor; float is faulty (leaks); float needle valve seat worn; the needle jet is worn; dirty air filter; spark plug break down; incorrect point gap or timing; point dirty or worn.
5. Engine Runs Too Hot & Piston Seizes. Carburetor settings too lean; fuel mixture to lean on oil; oil used is unsuitable; oil not properly mixed with fuel; ignition timing incorrect.
6. Engine Pings. Ingition timing incorrect, unsuitable fuel; carbon deposits on piston and in cylinder head.
Note: If it occurs at full throttle, main jet may be too small. If it occurs at 1/4 to 3/4 throttle, the needle jet may be set too low, or needle jet may be to lean.

ENDURO SECTION

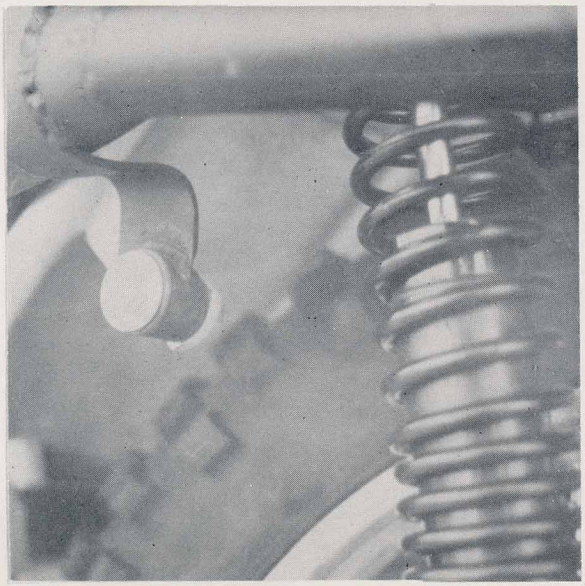
GENERAL INFORMATION

Exhaust Pipe Removal

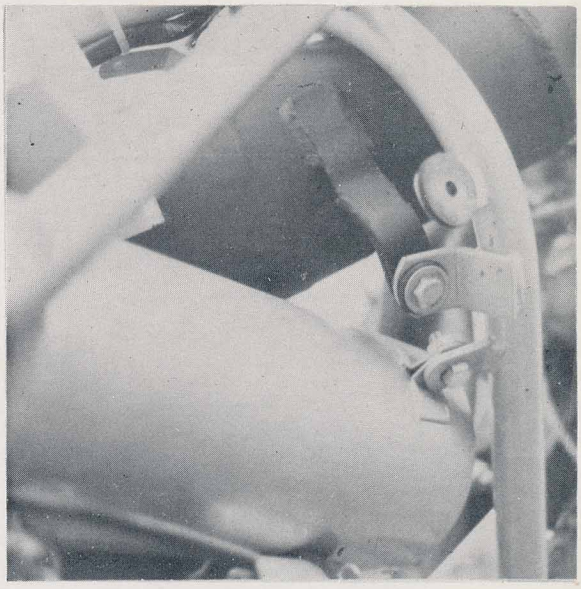


111

Remove the two fiberglass panels. Remove the two hold in springs at the exhaust port. The mounting bolts are located as shown below. Note: Slide pipe foreward and twist slightly to clear the frame tubes.

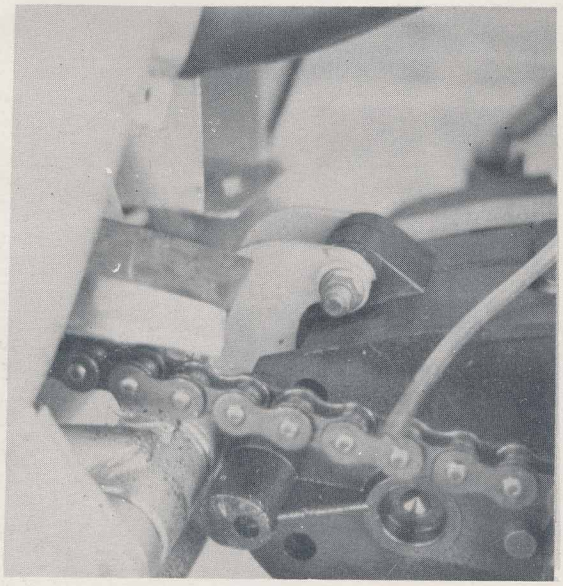


L/H Rear Bolt (near shock) 112

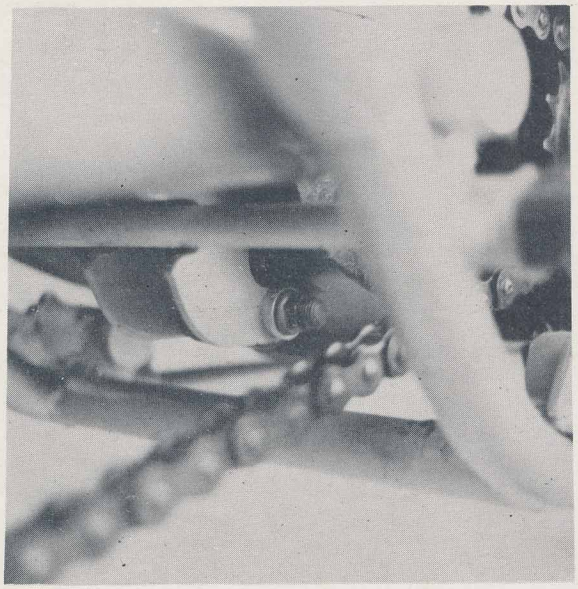


R/H Bolt (near air cleaner) 113

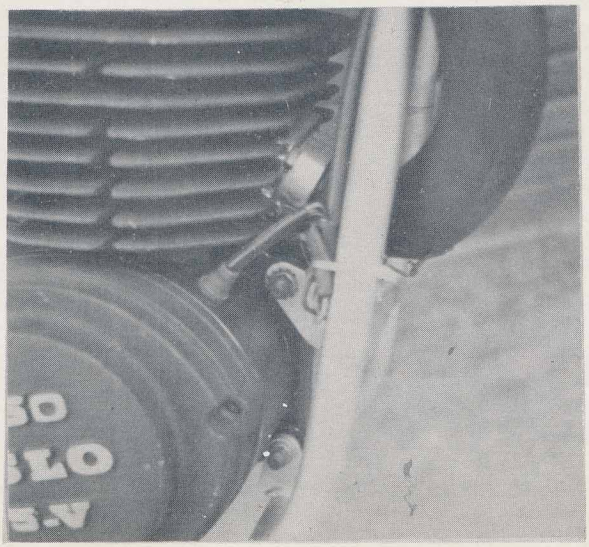
Engine Mounts



114 Top Rear



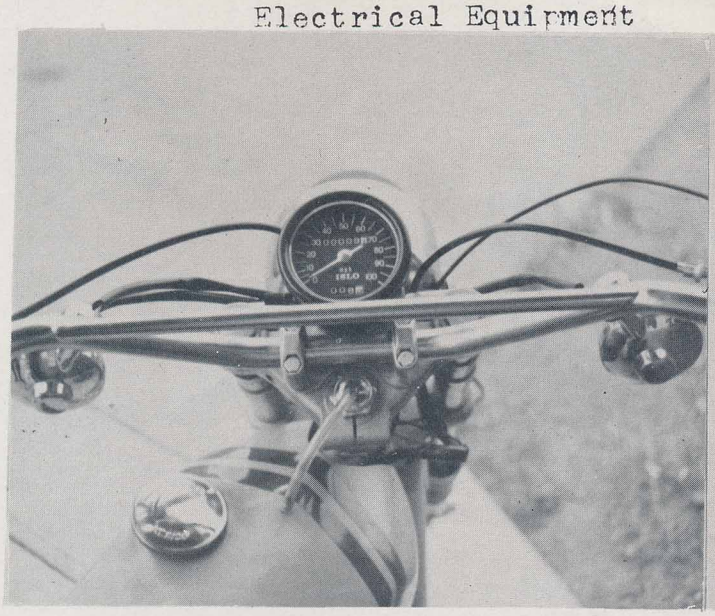
115 Lower Rear



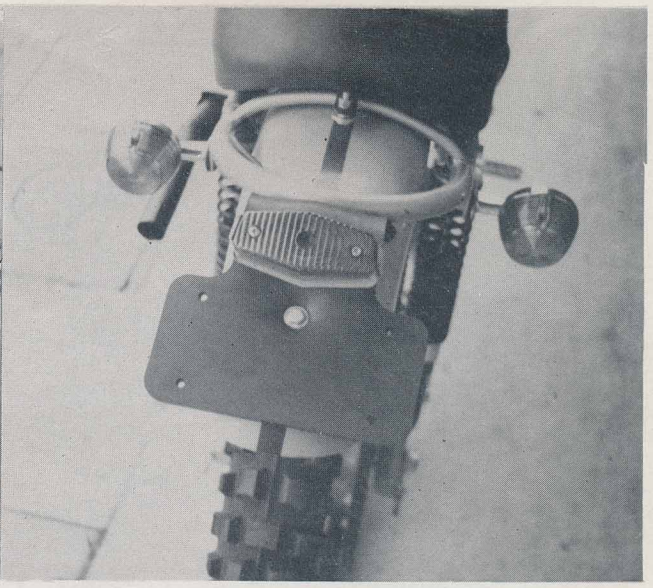
116 Front

E N D U R O

Electrical Equipment



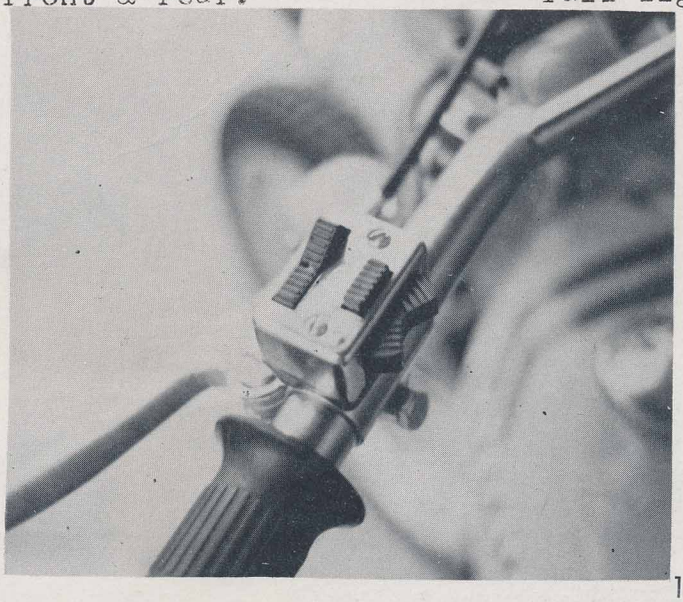
117



118

Turn signal front & rear.

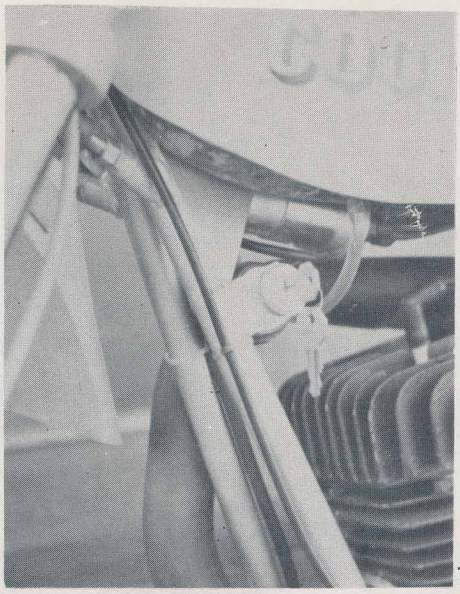
Tail light.



119

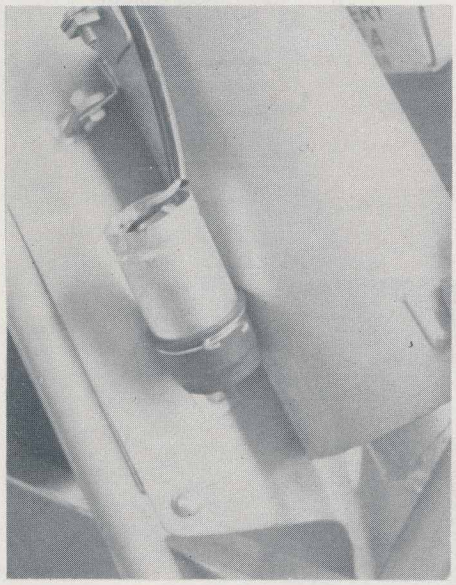
Handle Bar Switch

Switch incorporates the horn button, high and low beam switch, and turn signal switch.



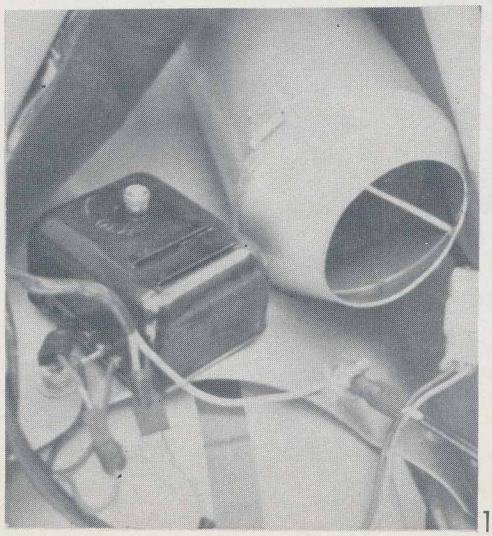
120

Main Switch. Just an on-off switch, is mounted on front L/H frame.



121

Turn signal flasher. Mounted beside air cleaner, behind R/H side panel.



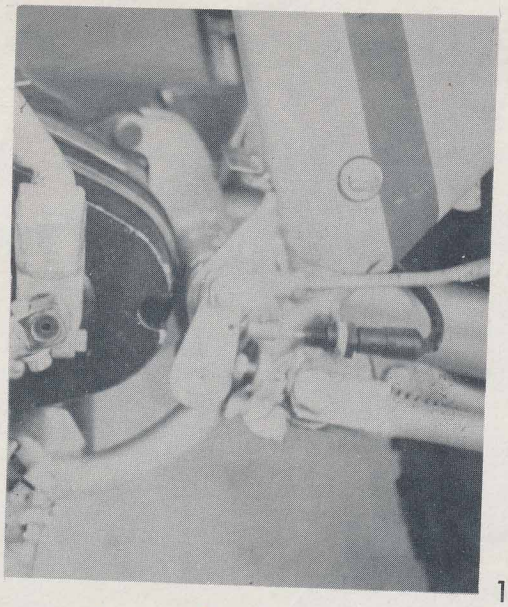
122

Voltage Regulator--mounted under seat.

ENDURO ELECTRICAL EQUIPMENT

Brake Switch--mounted R/H med-frame near brake arm and kick stand.

Battery--the battery box is located behind L/H side panel



123

32mm. Mikuni carb.
Needle Jet. - P8. } 250cx Yamaha.
Needle. - 6F5. }

239-14141-48.
239-14116-05.

E N D U R O

Electrical System

The Cooper magneto/alternator assembly comprises a dual electrical system. One half of the system incorporates the lighting coil, the other half incorporates the condenser, breaker point and primary coil. Both systems are mounted to a die cast alloy frame that is secured to the engine case. An aluminum flywheel, containing cast-in permanent magnets, is mounted on the right hand end of the crankshaft and surrounds the ignition and lighting components.

Thanks to Craig Scott