

BENELLI 4 STROKE 125 cc. " SPRITE „
200 cc. " SPRITE „
250 cc. " BARRACUDA „
FOUR AND FIVE SPEED

SHOP MANUAL

COSMOPOLITAN MOTORS, INCORPORATED
JACKSONVILLE & MEADOWBROOK ROADS, HATBORO, PA. 19040 (215) OS 2-9100

ENGINE - Single cylinder 4 stroke - Over head valves - bore 54 mm. - stroke 54 mm. - Cylinder displacement 123,7cc. - Compression ratio 9,5 to 1 - CV. 16 at 8.800 R.P.M. - Distribution with standard cam - Intake open 30° BTDC - Intake close 75° ABCD - Exhaust open 75° BBDC - Exhaust close 30° ATDC - Valve clearance with hot motor 0.006" - Forced lubrication by gear pump 60 L/H Oil capacity 2 qts - Gravity fuel supply 98 to 100 octane - Carburetor UB 22 BS - Ignition by alternator flywheel magneto with external H.T. coil - Ignition advance 19° - Plus automatic advance of 25° - Point gap 0.016" - Marelli Plug CW 260 L - Champion plug N. 3 - With multiplate clutch - Costant mesh gear box - Foot shift pedal - Primary transmission by helicoidal gears - Secondary transmission by chain 1/2" x 5/16".

FRAME - Combination of pressed steel and tubular - Double action hydraulic front fork - Rear swing arm with adjustable hydraulic shock absorbers.

TIRES - Pirelli 2.75 x 18" (rib.) front wheel - 3.00 x 18" (univ.) rear wheel - Expanding type brakes.

LIGHTING EQUIPMENT - Alternating current 6V 7 amp equipped with battery to ensure steady supply of current to lights and horn - Large 130 mm. headlight - Headlight: 6V 25/25 S. B.

OVERALL DIMENSIONS - Length 76.44" - Width 27" - Height 36.64" Weight 229 lbs. (DRY) - Fuel tank capacity 3,5 gallons - Reserve .05 gallons - Maximum speed 78 MPH - Fuel consumption 90 MPG.

MOTORCYCLE 200cc. (Technical data different from 125cc.)

ENGINE - Bore 66,5 mm. - Stroke 57 mm. - Cylinder displacement 197,9cc. - Compression ratio 8,8 to 1 - CV. 19,5 at 8.600 R.P.M. - Carburetor UB 22 BS - Ignition advance 9° 30' - Plus automatic advance of 29° with flywheel magneto ADP 79/AN.

(Note: with flywheel magneto ADP 54/2ANB ignition advance 17° - plus automatic advance of 25°).

TIRES - Pirelli 3.00 x 18" rib. front wheel - 3.00 x 18" univ. rear wheel.

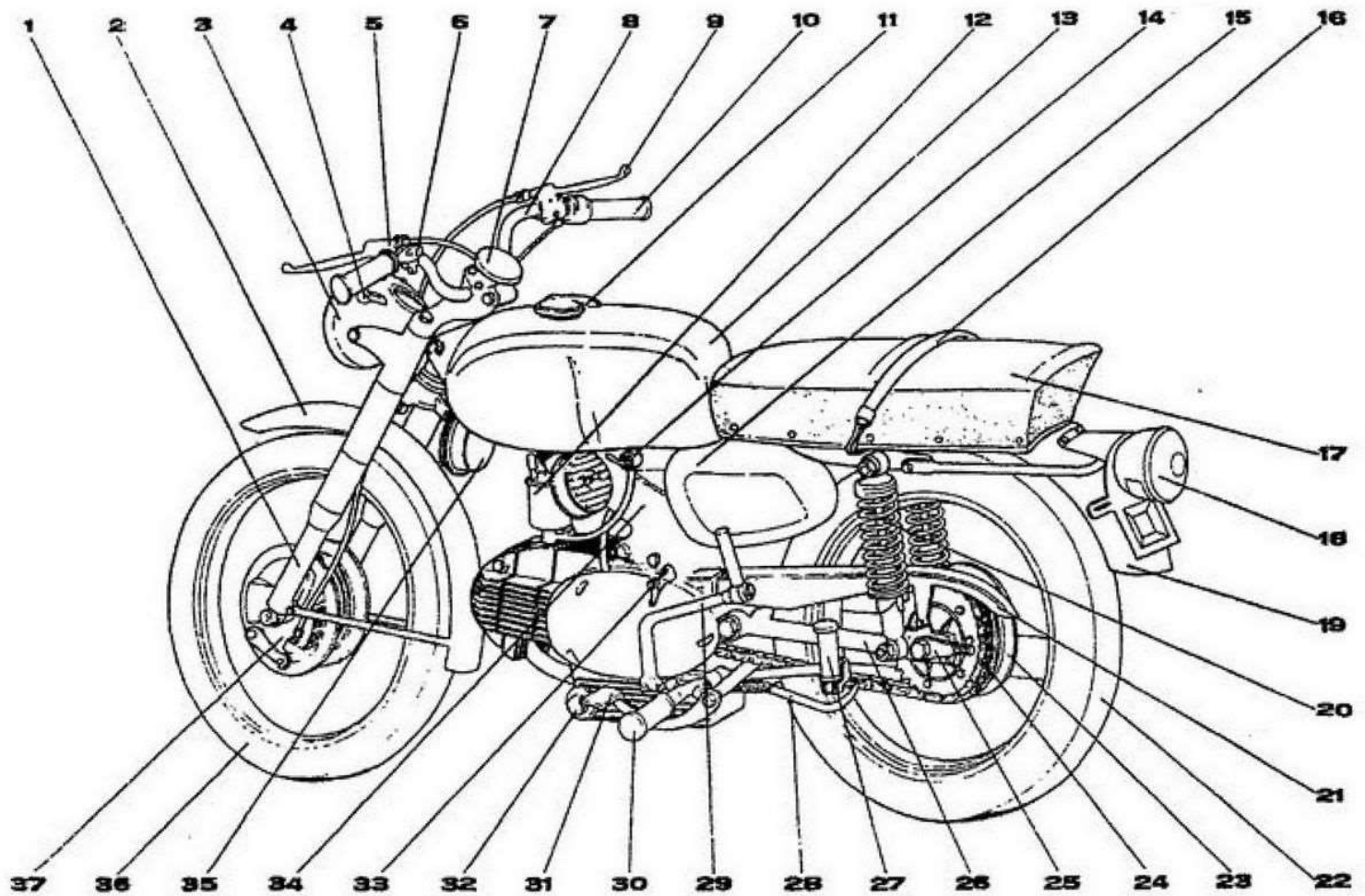
OVERALL DIMENSIONS - Weight 231 lbs. (DRY) - Maximum speed 90 MPH - Fuel consumption 85 MPG.

MOTORCYCLE 250cc. (Technical data different from 125cc.)

ENGINE - Bore 74 mm - Stroke 57 mm - Cylinder displacement 245.1cc. - Compression ratio 8,5 to 1 - CV. 24 at 8.500 R.P.M. - Carburetor UB 24 BS 2 - Ignition advance 9° 30' - Plus automatic advance of 29° with flywheel magneto ADP 79/AN and ADP 78/2ANB.

TIRES - Pirelli 3.00 x 18" univ. front wheel - 3.25 x 18" univ. rear wheel.

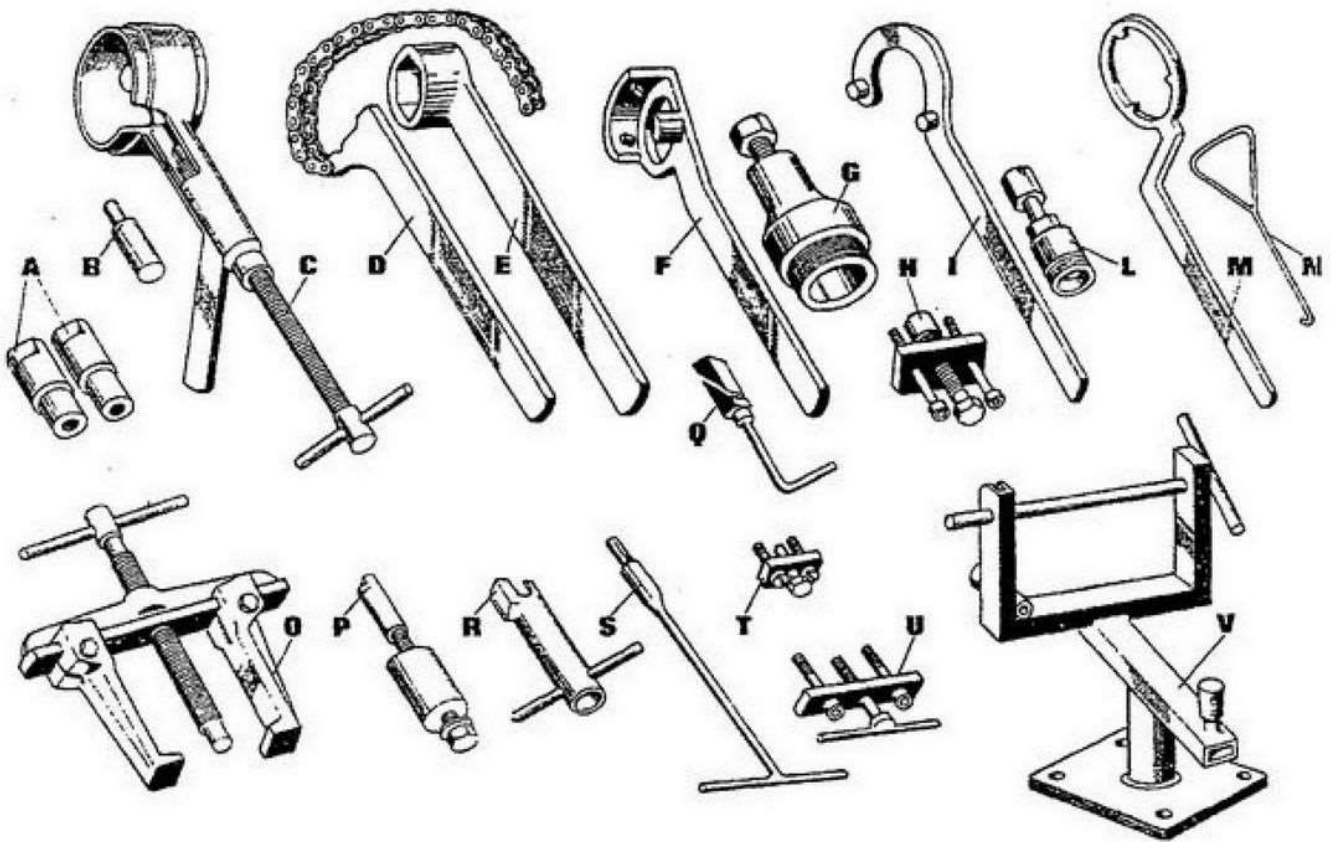
OVERALL DIMENSIONS - Weight 232 lbs. (DRY) - Maximum speed 95 MPH - Fuel consumption 80 MPG.



- | | | |
|---------------------|-------------------|--------------------|
| 1 Front fork | 14 Petcock | 27 Rear foot rest |
| 2 Front fender | 15 Tool box | 28 Stand |
| 3 Headlamp | 16 Strap | 29 Kickstart |
| 4 Switch key | 17 Seat | 30 Foot rest |
| 5 Clutch lever | 18 Rear light | 31 Brake pedal |
| 6 Dimmer switch | 19 Rear fender | 32 Oil drain plug |
| 7 Damper | 20 Shock absorber | 33 Clutch adjuster |
| 8 Handlebar | 21 Chain guard | 34 Frame |
| 9 Front brake lever | 22 Rear wheel | 35 Horn |
| 10 Throttle control | 23 Rear hub | 36 Front wheel |
| 11 Gas cap | 24 Chain | 37 Front hub |
| 12 Carburetor | 25 Chain adjuster | |
| 13 Gastank | 26 Rear fork | |

SPECIAL TOOLS

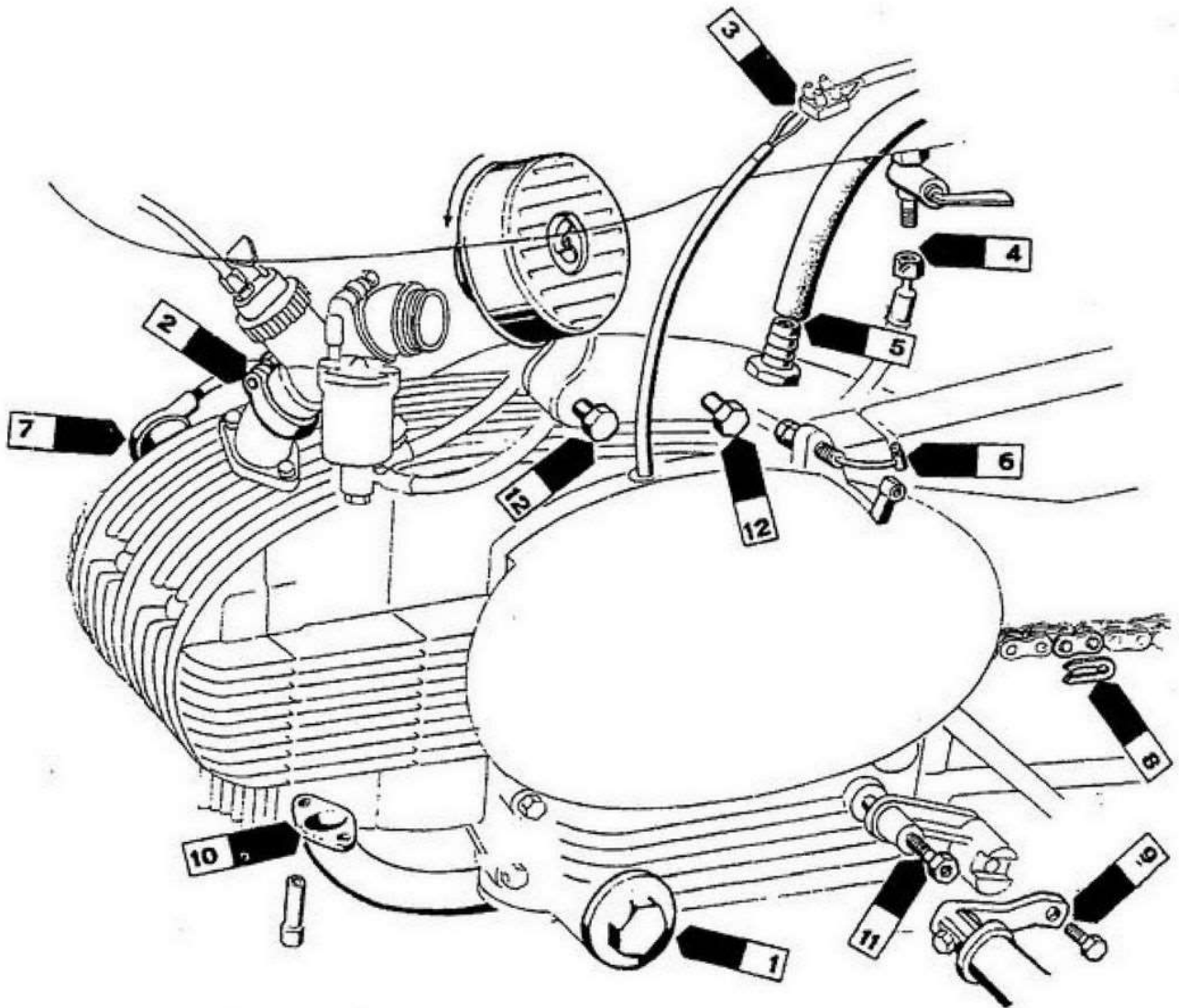
Special tools are made in order to facilitate disassembly and reassembly operations, and used with metric wrenches, will enable you to perform all necessary operations.



A	Thread protecting bushings	138&139/MB
B	Piston pin shaft extractor	} 144/MB
C	Piston extractor	
D	Countershaft sprocket holder	141/MB
E	Countershaft sprocket wrench	140/MB
F	Engine pinion holder	131/MB
G	Engine pinion puller	143/MB
H	Engine pinion puller	146/MB
I	Flywheel magneto holder	132/MB
L	Flywheel magneto extractor	137/MB
M	Clutch hub holder	130/MB

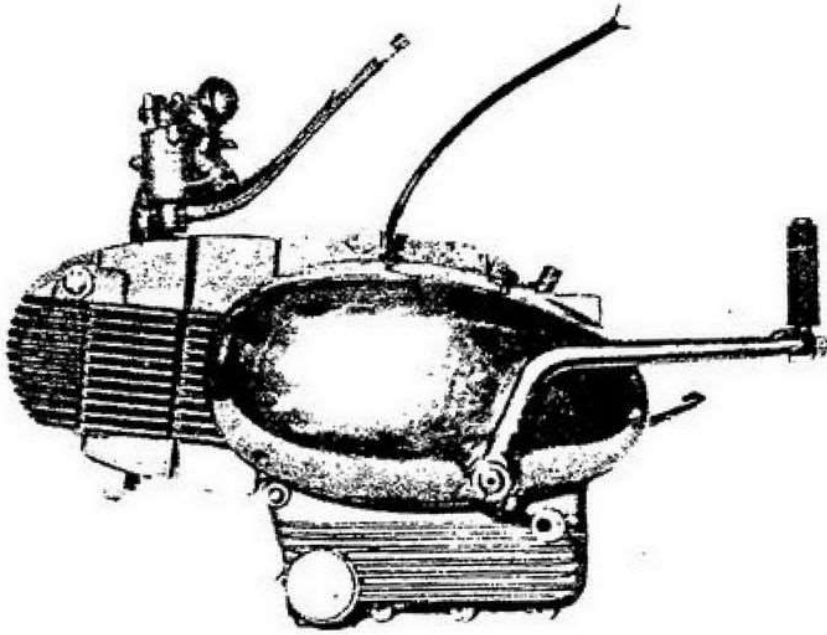
N	Clutch spring tool	135/MB
O	Universal puller	133/MB
P	Cam follower bushing extractor	134/MB
Q	Crankshaft spacer	G 276
R	Kick starter spring holder	142/MB
S	5mm Allen wrench	G 262
T	Shifting drum puller	136/MB
U	Cam gear extractor	147/MB
V	Engine support	145/MB

Before performing any operation, it is advisable to thoroughly clean the machine, in order to prevent any dust particles from accumulating on engine components.

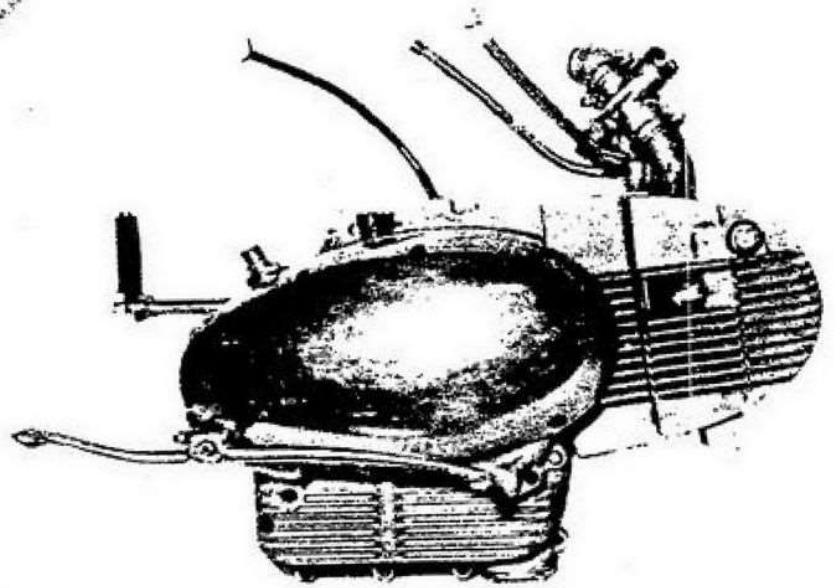


- 1) Remove engine oil, using 27mm wrench to unscrew oil plug. Then remove oil filter assembly.
- 2) Loosen carburetor clamp with 8mm wrench and pull out carburetor after air filter has been removed.
- 3) Remove electric wires from junction box.
- 4) Unscrew fuel lines with 12mm wrench.
- 5) Pull out engine breather tube.
- 6) Loosen clutch cable clamp and pull out cable.
- 7) Pull out the spark plug cap.
- 8) Remove with pliers, master link clip, master link and chain.
- 9) Unscrew foot peg bolts with 17mm wrench. Remove knurled nut of brake rod.
- 10) Remove exhaust pipe and muffler.
- 11) Unscrew lower engine stud nut using 17mm wrench - press out stud.
- 12) Remove upper engine studs nuts with 14mm wrench, also studs and engine from frame.

To reassemble, reverse above instructions.



Engine view flywheel magneto side



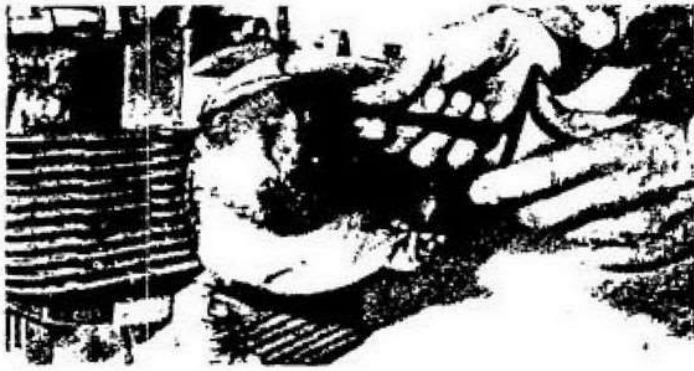
Engine view clutch side

NOTE:

Due to the unique characteristics of the engine, most of the operations shown in this book can be made with the engine on the frame. Only if the crankcase must be split, will engine have to be removed.

By removing the left hand cover, the flywheel magneto, clutch adjuster and countershaft sprocket are accessible.

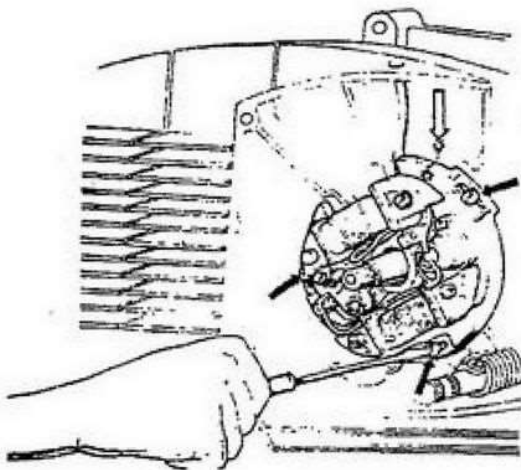
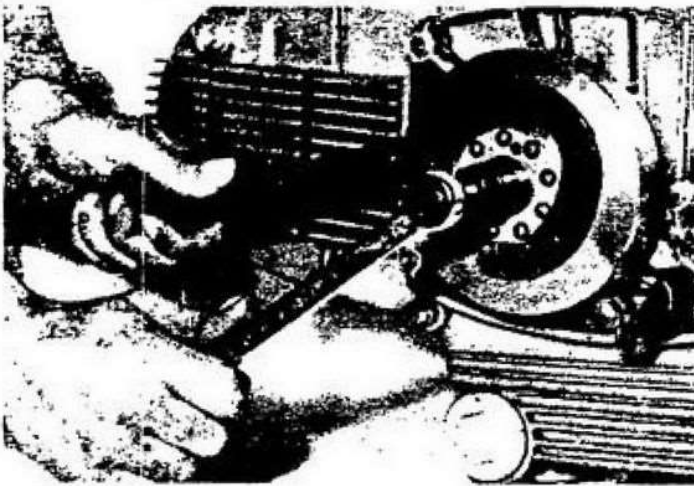
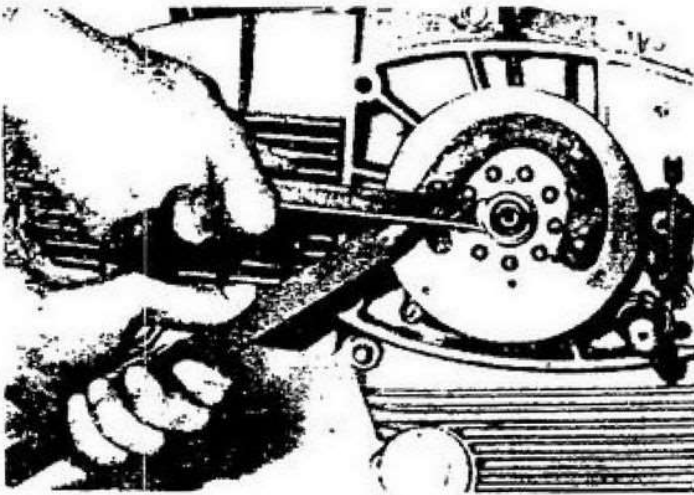
By removing the right hand cover, the clutch, preselector components and cam distribution gears are visible. These are operated in oil bath, therefore, this cover must be perfectly sealed. The cylinder head, rocker arm and cylinder are removable from the front side.



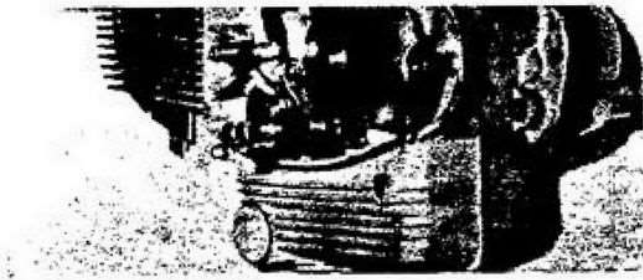
Remove the flywheel magneto cover (flywheel magneto side) with tool S, removing the three fastening screws.

Remove the flywheel magneto nut, using 19mm wrench, holding at the same time, the flywheel with tool I.

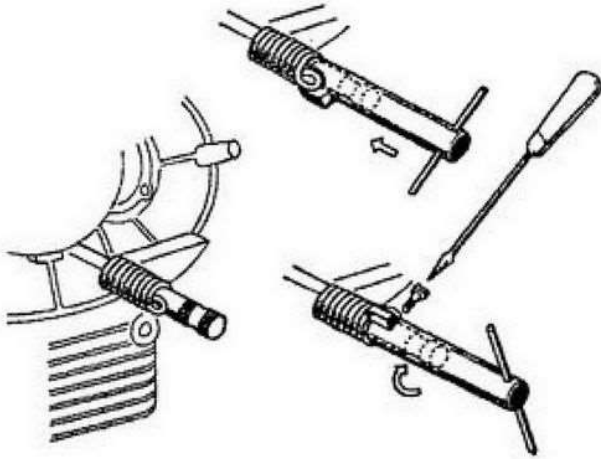
Lock the flywheel puller L in position and with 22mm wrench, loosen the flywheel from crankshaft. Tap on the puller bolt slightly with a hammer if the flywheel is hard to remove.



Before removing the backing plate, it is advisable to make a reference mark on the crankcase in order to facilitate the reassembly operation.



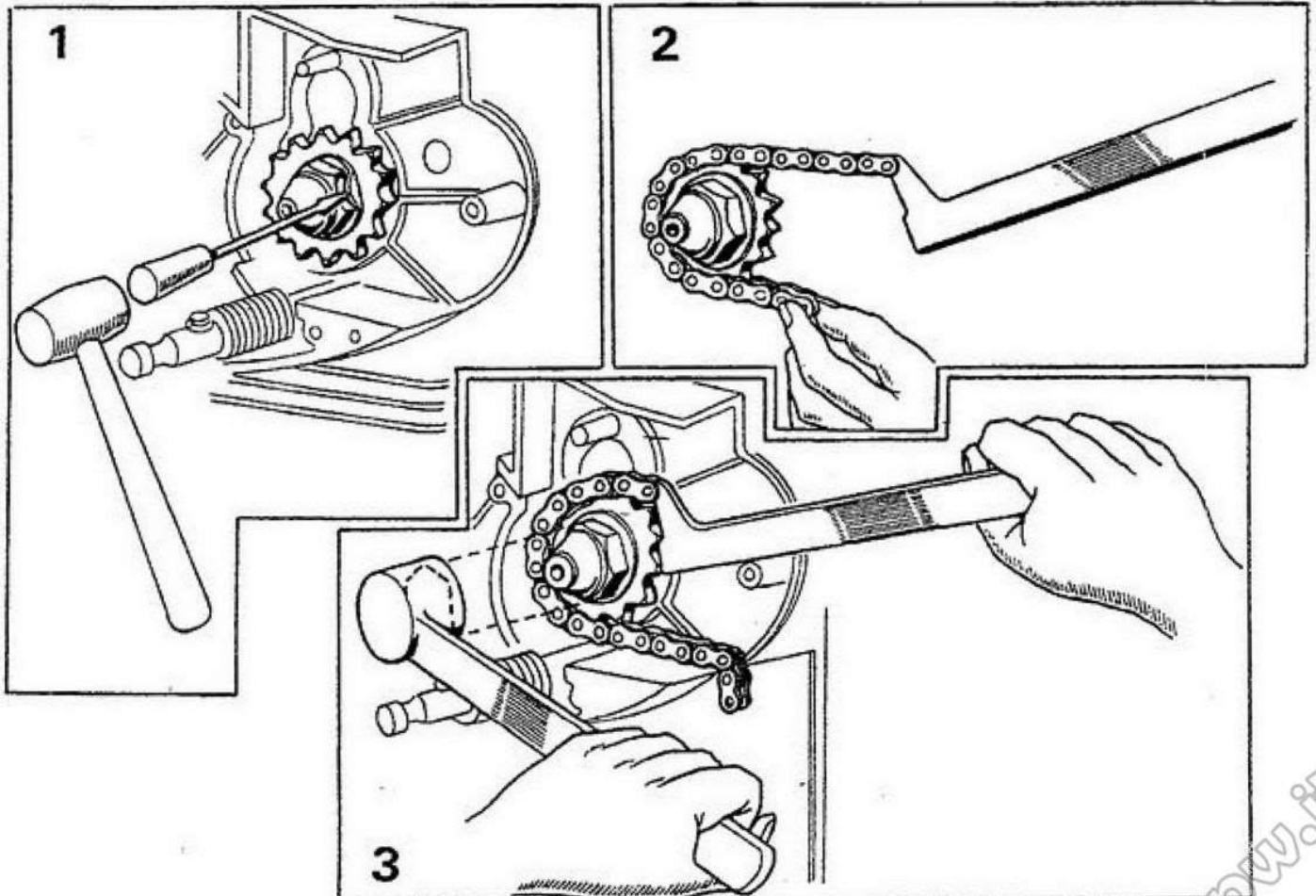
Remove clutch lever support screws using tool S. With screw driver, unscrew flywheel protection cover fastening screws.

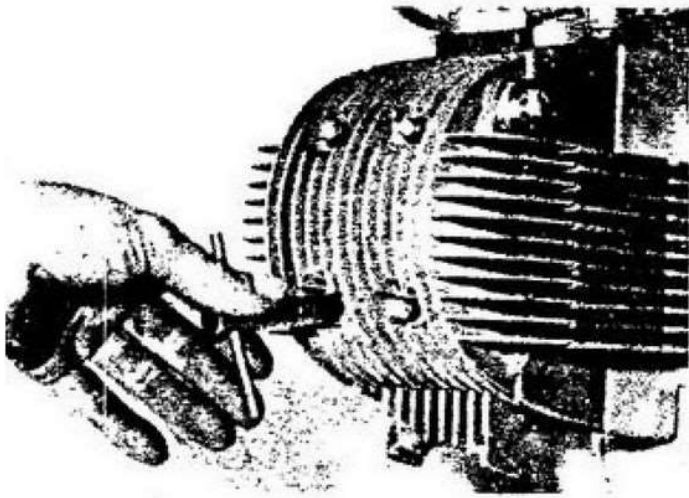


Holding kick starter spring with tool R, remove with screw driver the spring fastening screw.

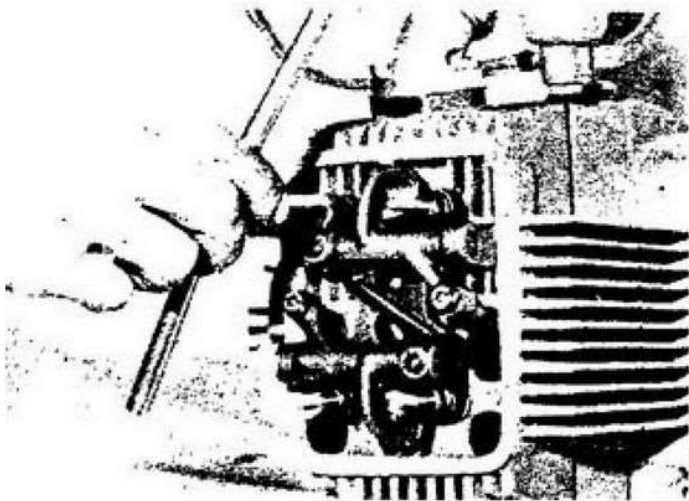
To remove countershaft sprocket it is necessary to:

- 1) Lift up the safety washer loop.
- 2) Install the special tool D.
- 3) Remove the nut with special wrench E, holding at the same time the countershaft sprocket with tool D.





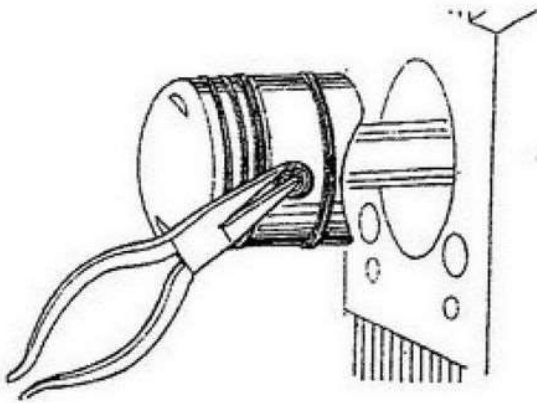
With 10mm socket wrench, remove the 4 rocker cover fastening screws. Pull out cover and aluminum gasket.



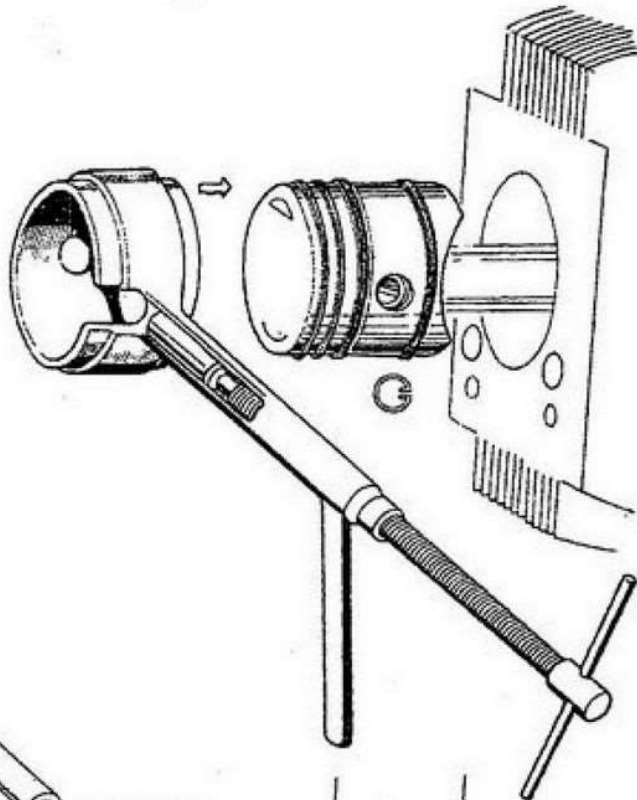
Before removing with 12mm socket wrench, the four cylinder head nuts, be certain that the piston is in compression stroke position. Pull out the rocker arm support carefully in order not to damage the threads of the cylinder studs.



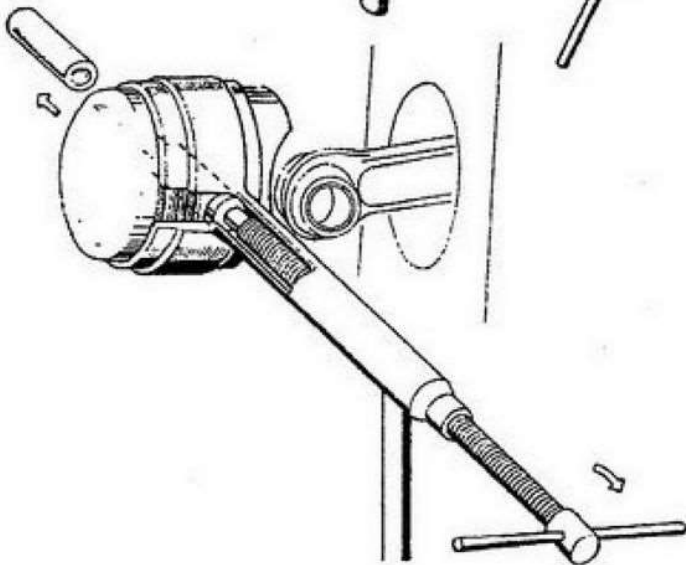
Pull out the cylinder head, gasket, cylinder and base gaskets.



Remove with pliers the two piston pin circlips.

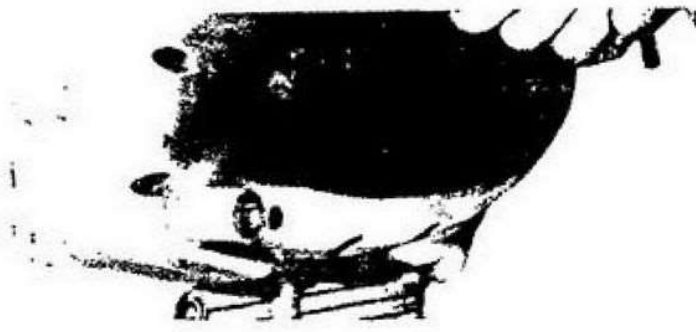


Insert the pin B in the tool C. Install the tool C on the piston. (It is advisable to slightly heat the piston before removing the pin).

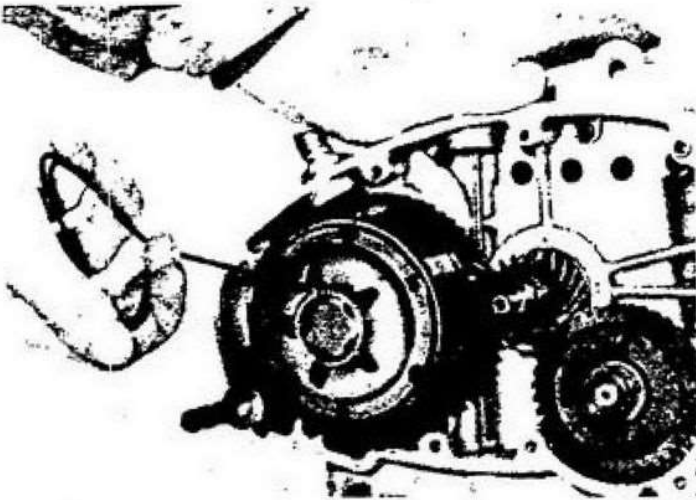


Turn the spindle until the piston pin is removed from the connecting rod.

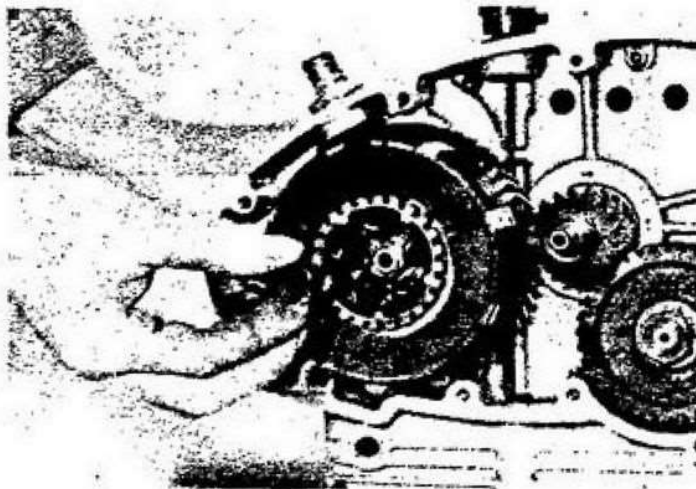
NOTE: It is not necessary to remove the piston rings, to remove the piston.



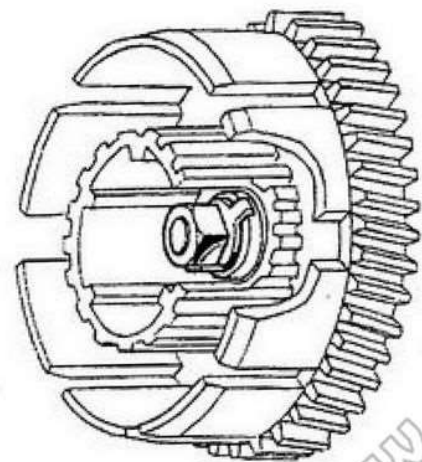
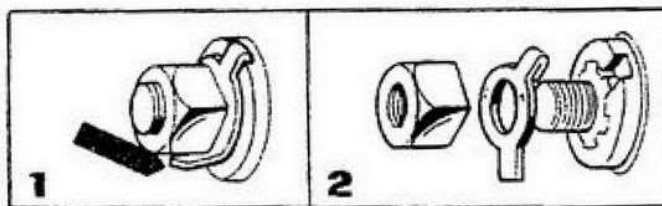
After the shifting lever has been removed, unscrew the 10 Allen screws with the tool S. Tapping slightly with plastic hammer, pull out cover.

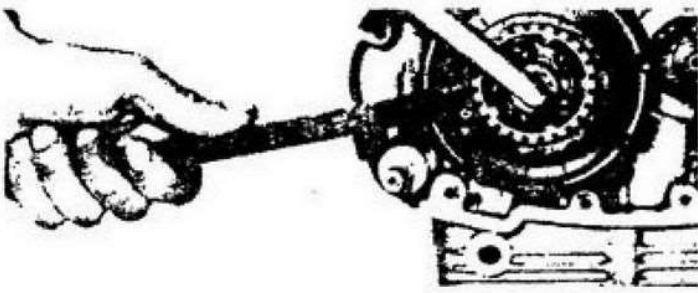


Dismantling of the clutch
With the special curved tool N, disconnect the five clutch springs.

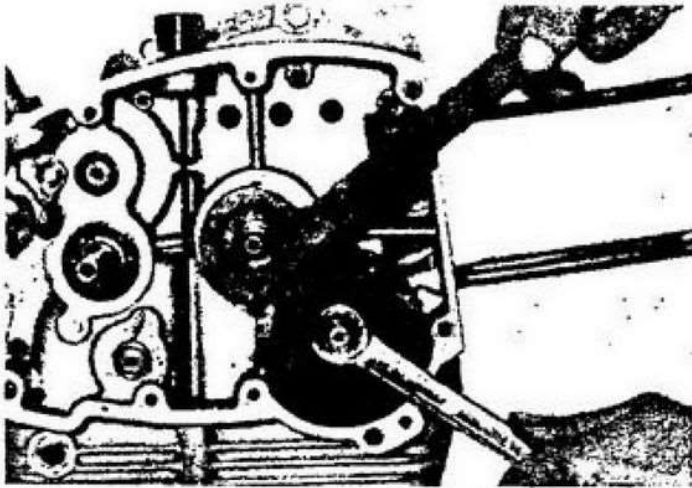


Remove the clutch plates and the short clutch rod.
Lift up the loop of the safety washer (bent over the nut).

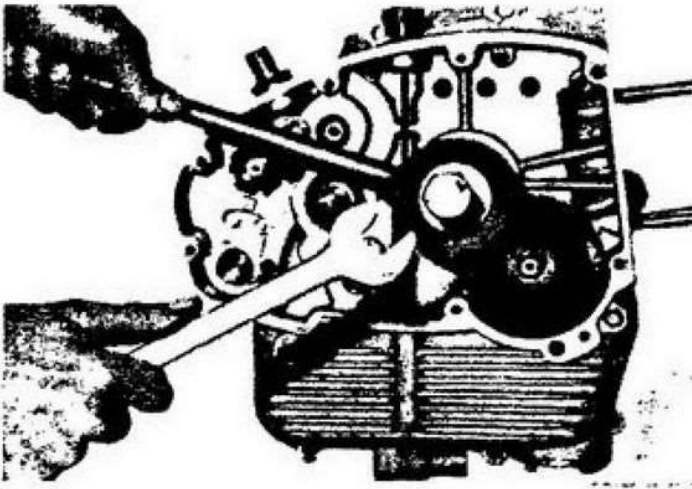




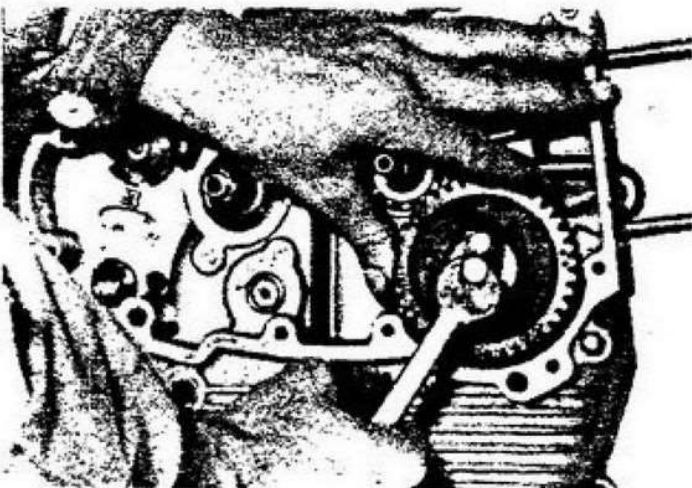
Holding the clutch drum with special tool M, unscrew the locking nut using 17mm wrench. Then pull out the clutch drum, thrust washer, clutch crown and second thrust washer.
Pull out the preselector shaft.



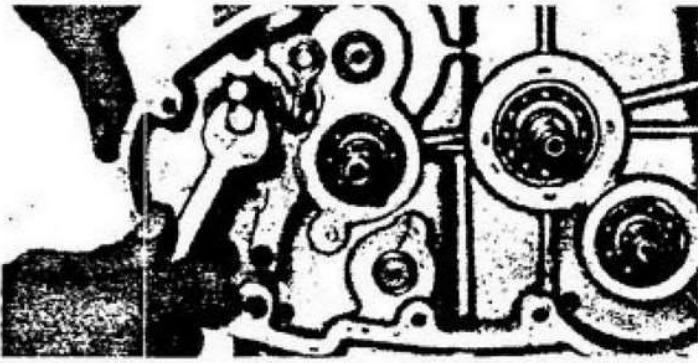
Holding with special tool F, the engine pinion gear, remove the cam gear and engine pinion gear locking nuts.



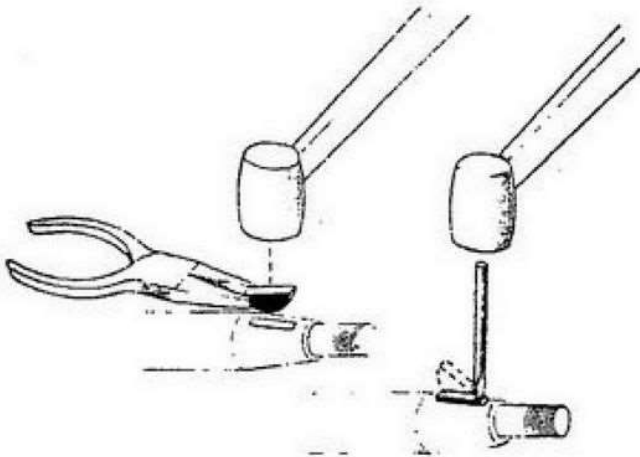
With special puller G, remove the engine pinion gear.
NOTE: If the special puller G can not be use, use puller H.



Using extractor O, pull out the cam gear.
NOTE: Use special puller U with gear having two threaded holes.



After the nut of the selector drum has been removed, using 11mm socket wrench, pull out drum with special tool T.



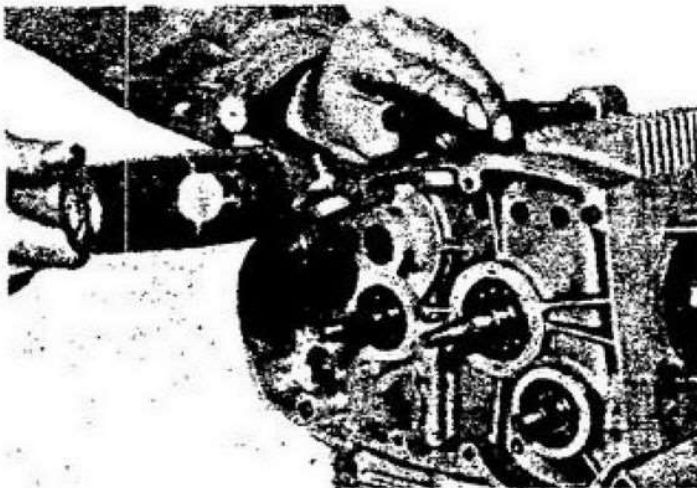
Extract the Woodruff keys of the engine pinion gear, cam shaft and desmodromic shaft.

To remove the Woodruff key, it is advisable to use a small pin in order to rotate it. To install Woodruff key, hold with pliers and tap slightly.

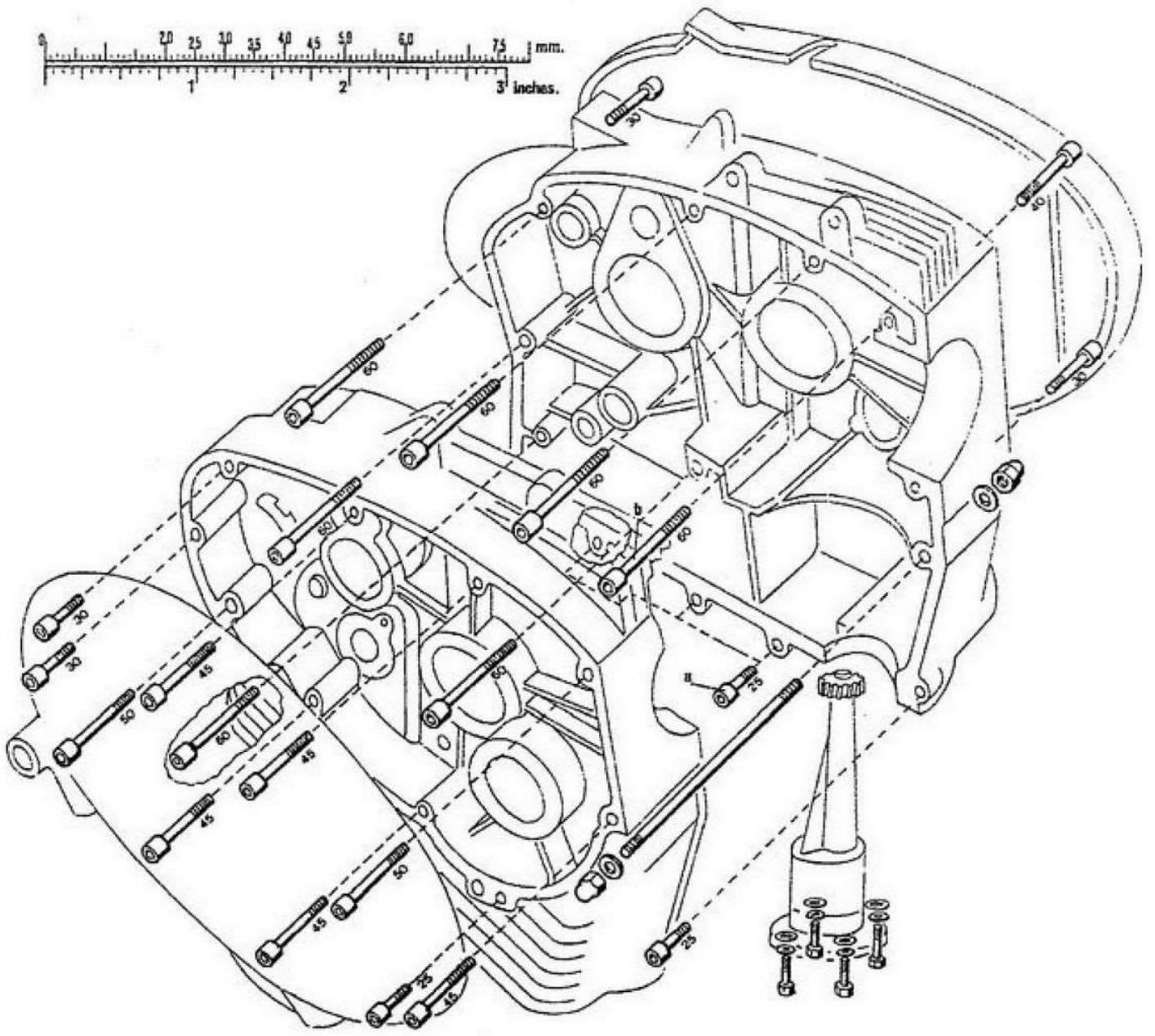
How to split the crankcase:

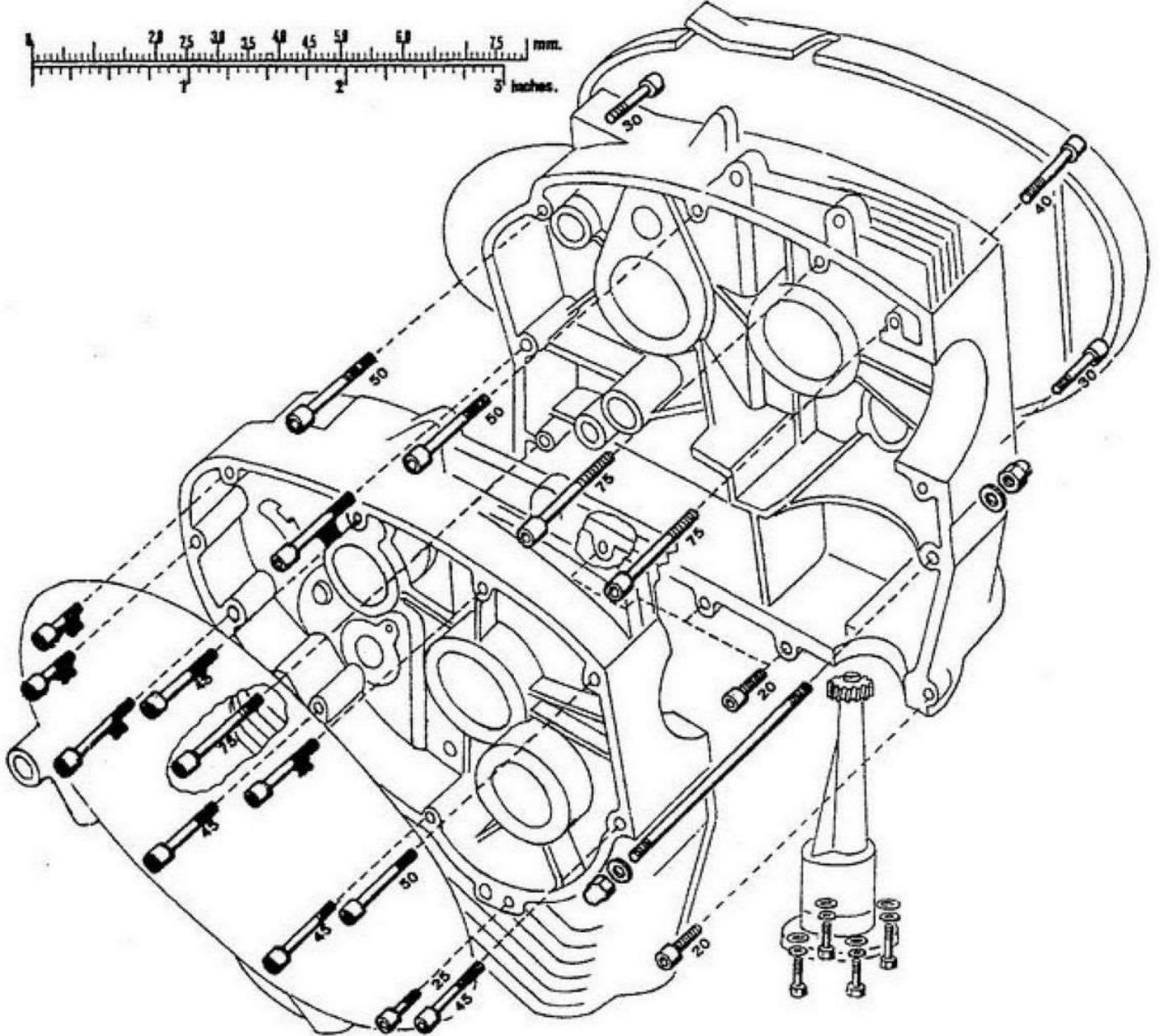
Remove the four oil pump bolts with 10mm wrench.

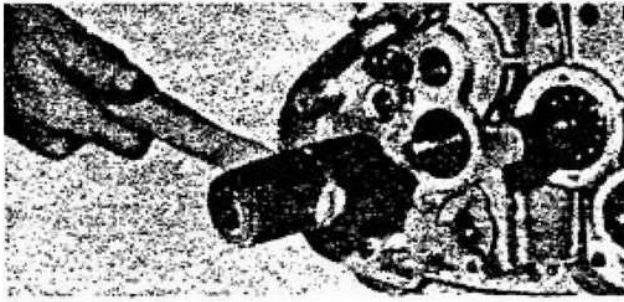
Use 11mm wrench to unscrew crankcase stud nut from one side, then pull out the stud. Unscrew and remove the Allen bolts, using tool S. The screws are indicated on sketch on page 14-15



With a pin, press out the crankcase centering bushing.





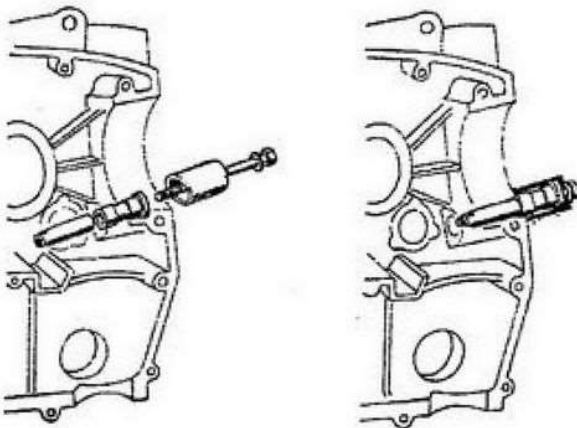


Install the protecting bushing A tightly on the crankshaft.

It is advisable to slightly heat the crankcase before proceeding to split it. (140° F. H.) Tap slightly with plastic hammer on primary shaft and crankshaft until the right hand crankcase is separated from the other half.

Remove all the components and clean thoroughly.

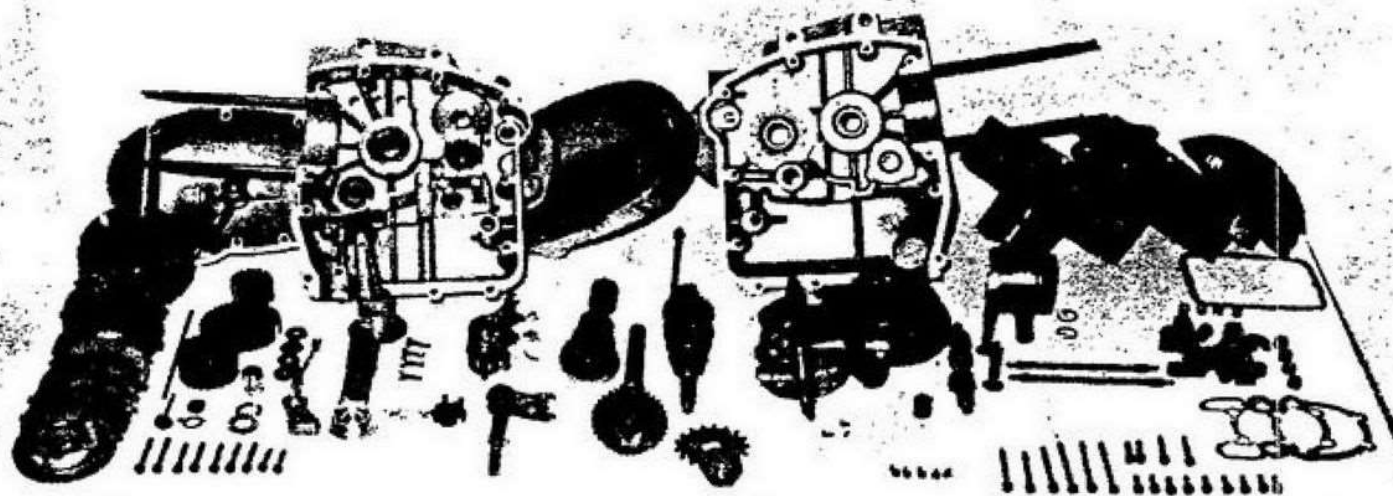
To disassemble the crankshaft from the left hand side crankcase, install tightly the coarse threads protecting bushing and proceed as per above instructions.



Heat the crankcase at approximately 140° to 180° Fahrenheit before removing bearing from it.

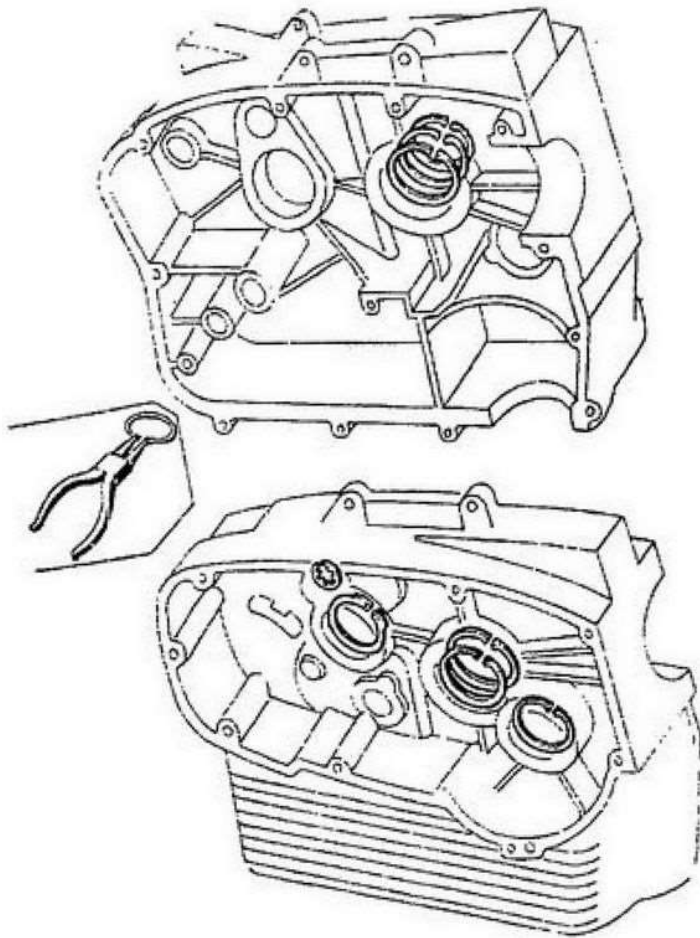
To remove the camshaft and final gear drive bearings from left hand crankcase (flywheel magneto side), dismantle the two bearing covers and press out.

To replace the cam follower bushings, use special extractor P as indicated on the figure alongside.



the seeger rings and other components.

NOTE: The two half crankcase are joined without gaskets, therefore, any imperfections of the contact faces must be corrected.



List of seeger assembled on 5 speed engine crankcases

Left hand half crankcase, (Flywheel magneto side).

No. 2 seeger rings type 47J assembled into the main bearing seat.

No. 1 seeger ring type 47J must be installed after the large bearing is assembled.

Right hand crankcase (clutch side).

No. 2 seeger rings type 47J assembled into the main bearing seat.

No. 1 seeger ring type 40J assembled into the camshaft bearing seat.

No. 1 seeger ring type 40JV assembled into the primary shaft bearing seat.

No. 1 seeger ring type K assembled into the secondary shaft bearing seat.

NOTE: This seeger must be installed (after the crankcase are joined).

List of seeger rings assembled on 4 speed engine crankcases

Left hand half crankcase (Flywheel magneto side)

No. 1 seeger type 47J assembled on the main bearing seat.

Right hand half crankcase (clutch side) FOR 200cc and 250 cc.

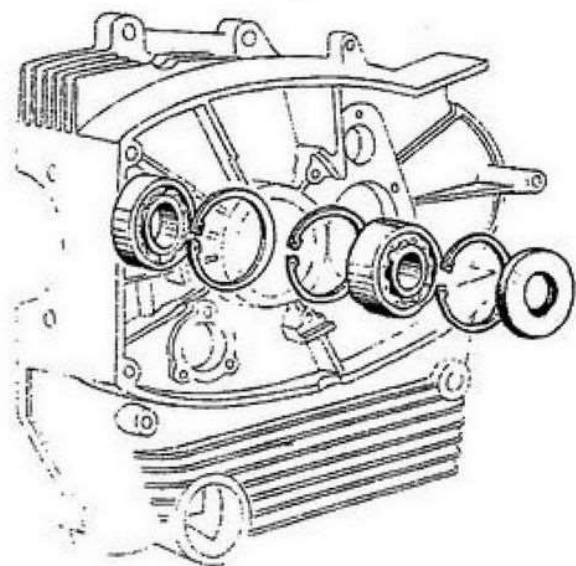
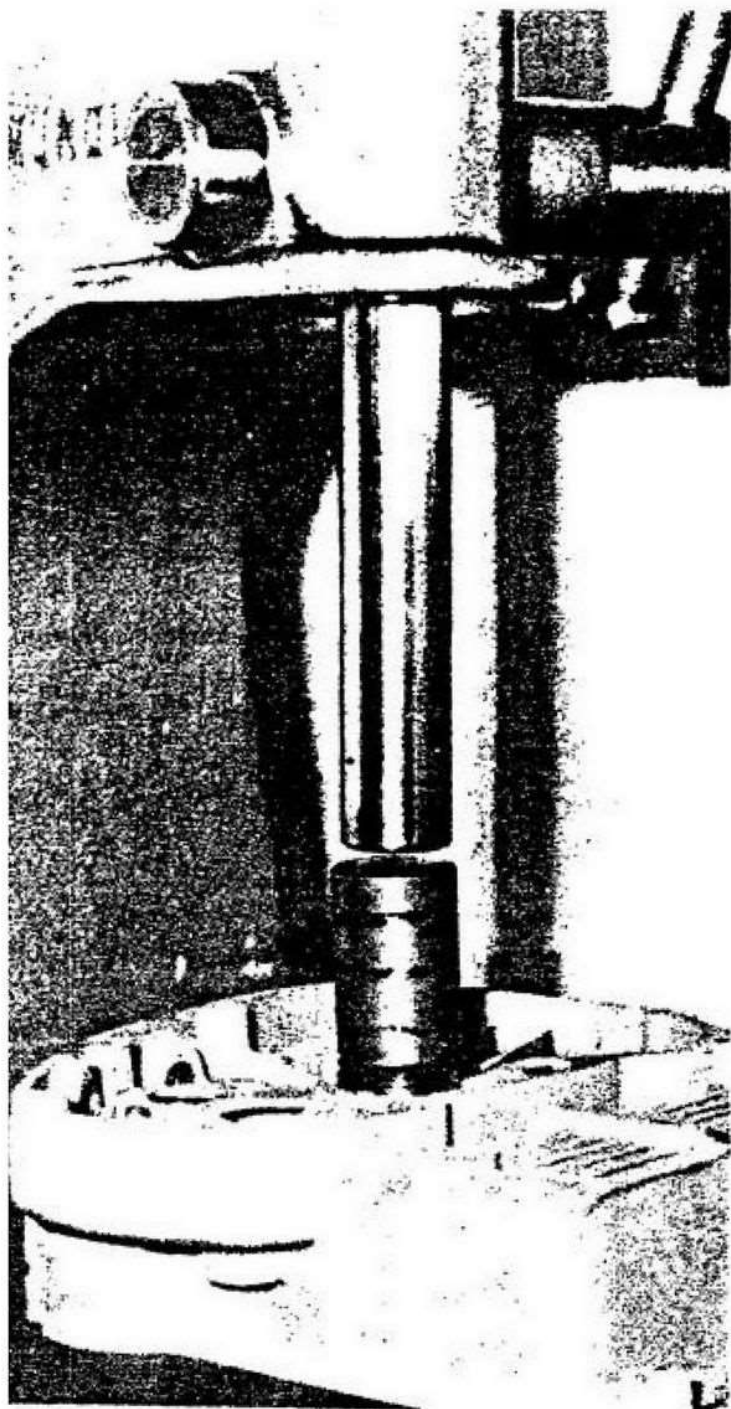
No. 1 seeger ring type 47J assembled into the main bearing seat.

Right hand half crankcase (clutch side) FOR 125cc.

No. 2 seeger ring type 47J assembled into the main bearing seat.

NOTE: All the other seeger rings are interchangeable.

After all the seeger rings are installed into the half crankcases and before the installation of all the bearings, it is necessary to heat the crankcase at approximately 140° to 180° Fahrenheit.



List of bearings installed into left hand crankcase (5 speed engine).

1 Bearing 25-47-14 for crankshaft (inner side).

1 Bearing 20x47x20,6 (double race) for crankshaft (external side).

1 Bearing 25x52x12 for primary shaft installation from the external side of crankcase.

The bearing must be even with crankcase face externally.

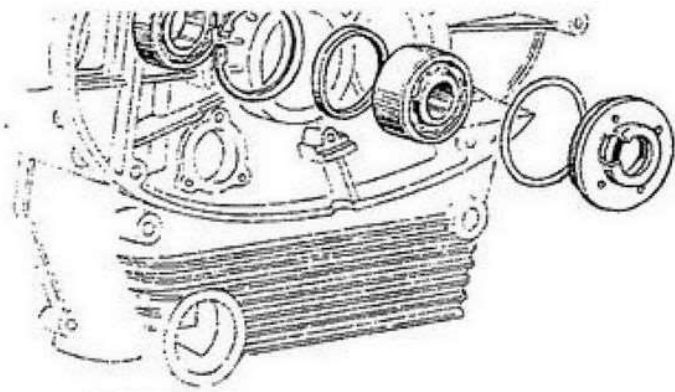
1 Bearing 12x32x10 for camshaft.

1 Steel bushing for secondary shaft needle cage installed internally.

1 Cam follower bushing.

Install the seeger rings J 47 from the external side. Then install the oil seal 20x47x8.

Install oil ring into the kick starter shaft hole.

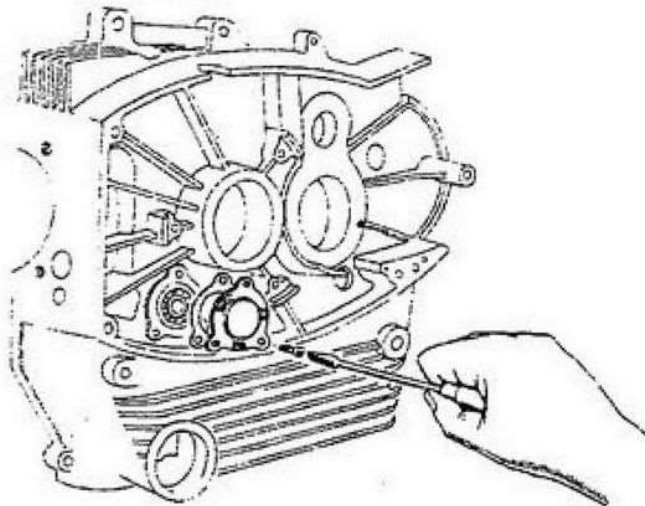


1 Bearing for crankshaft installed externally (20x47x20,6 with double races).
1 Oil seal 20x30x7.

Install the crankshaft oil seal into the threaded ring (20x30x7).

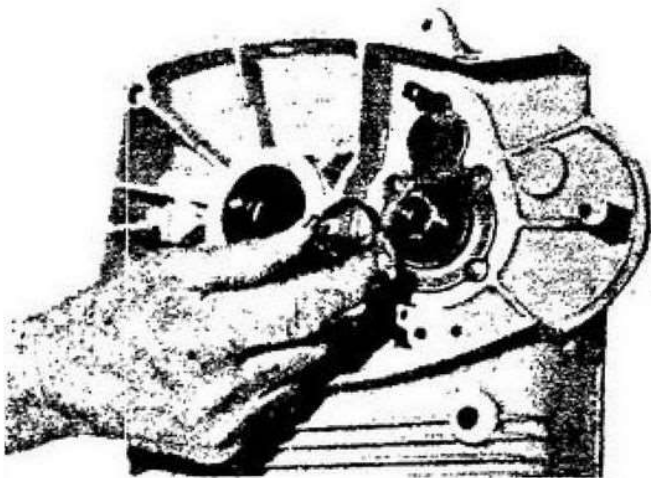
Assemble gasket and ring on the external side of crankcase.

The oil seal and plate of the final gear drive are assembled on the external side of crankcase.

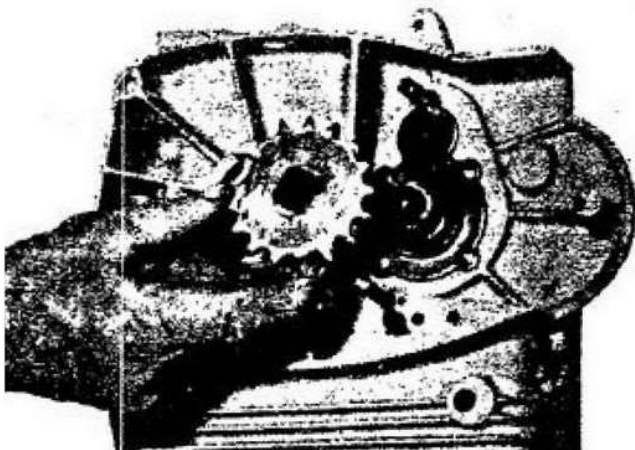


The special supporting screw of the dust protecting plate must be installed on the upper side of the engine (see picture alongside).

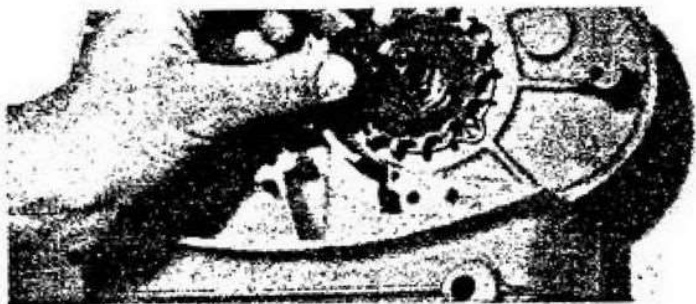
Install the cam shaft bearing cover with the respective gasket and lock the three screws tightly.



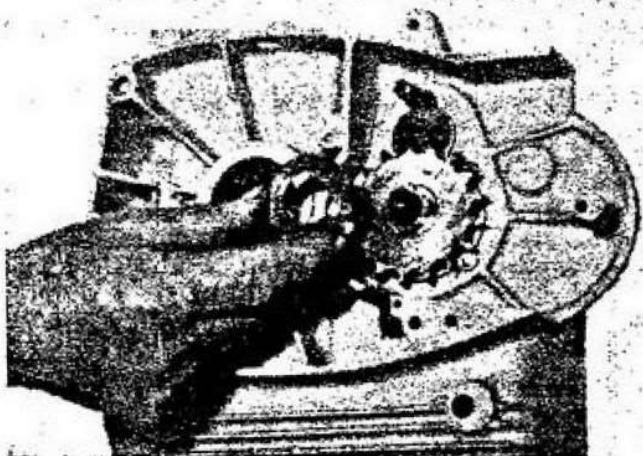
Install the final drive gear (internally) and from the external side, press in the countershaft sprocket spacer.



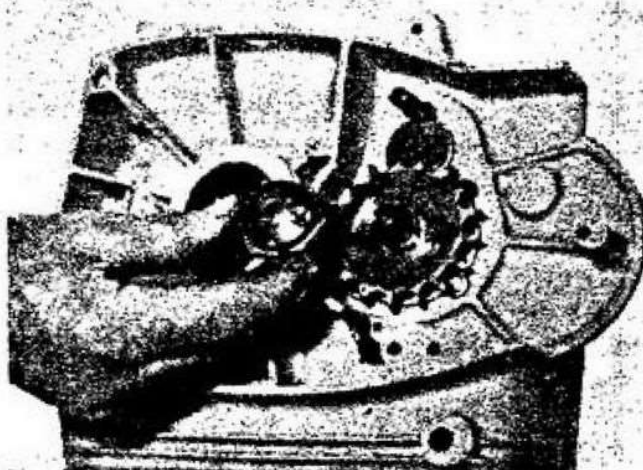
Assemble the countershaft sprocket.



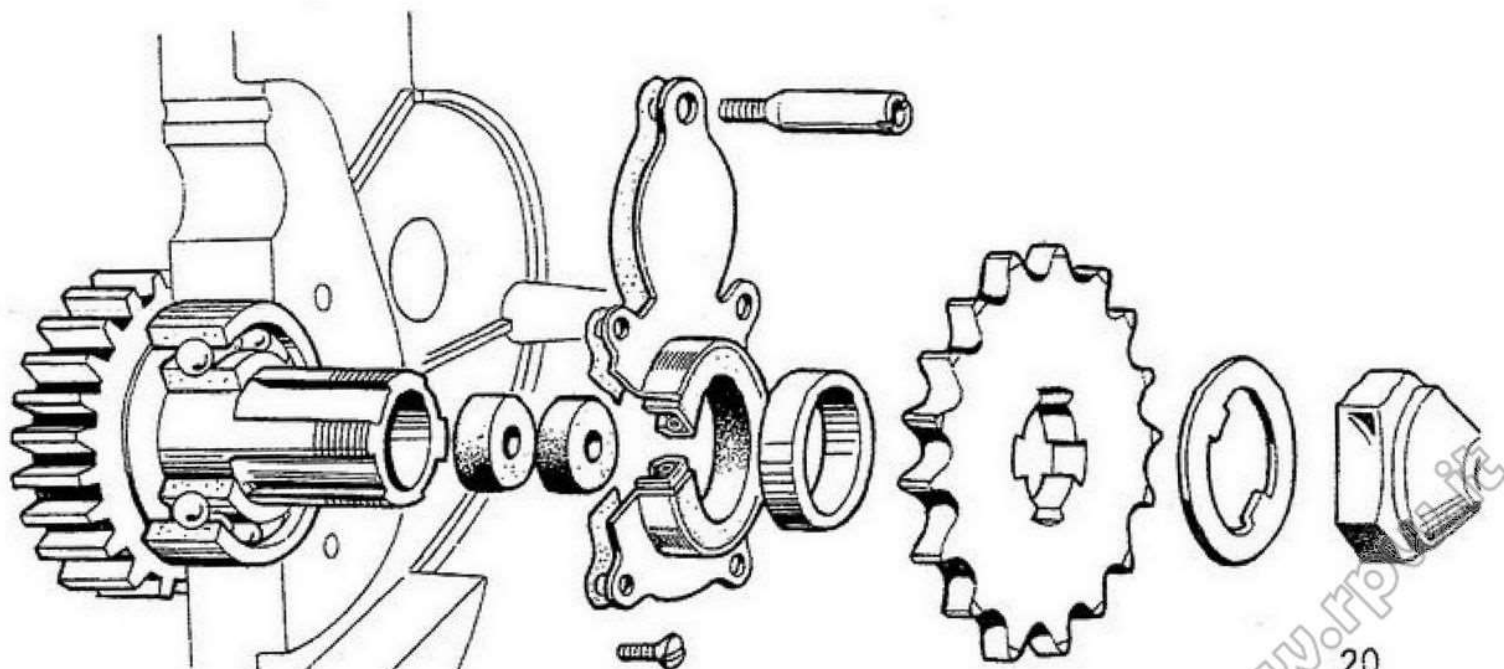
Install the two clutch rod oil seals into the final drive gear.

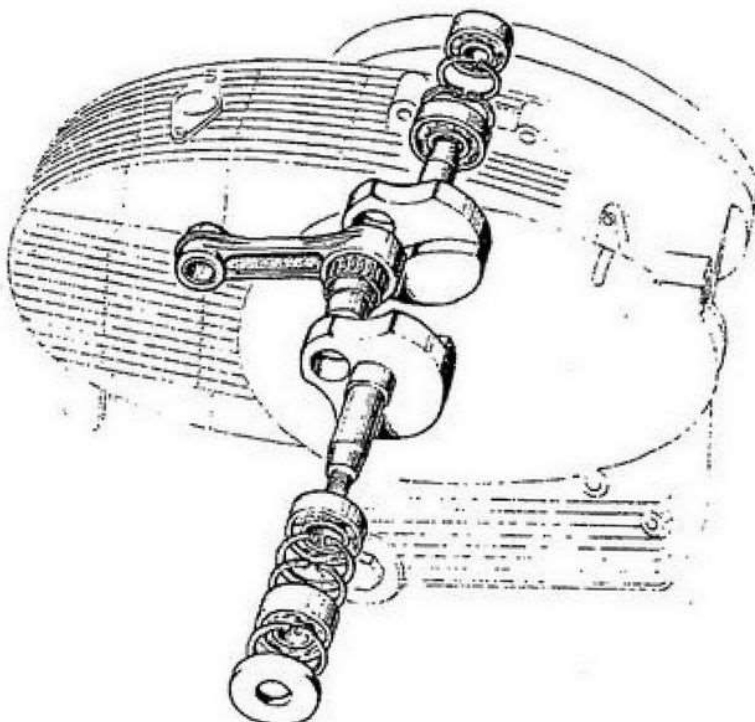
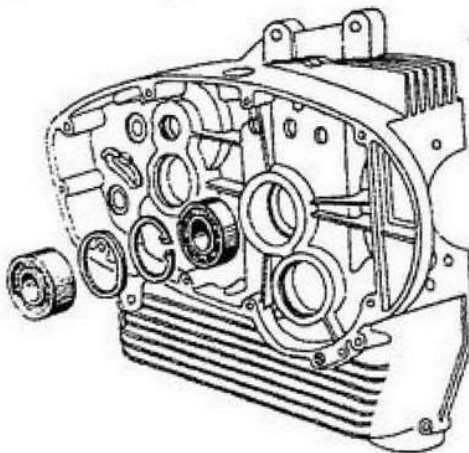
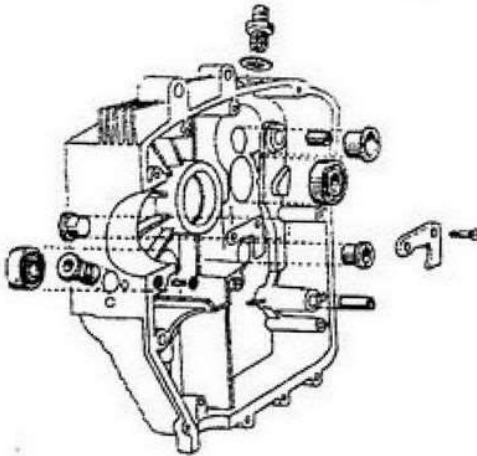
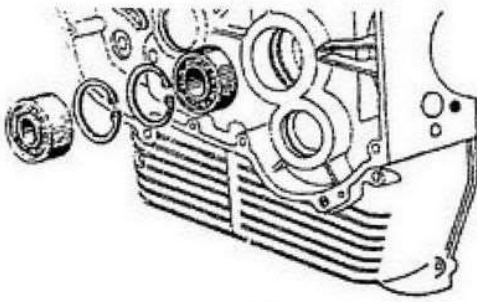


Assemble special safety washer.



Use special tools D and E to lock the countershaft sprocket nut. (FT-LB 65). Bend safety washer over nut face.





nally (20x47x20,6 double race).

NOTE: For 125cc.

(1 Bearing 20x47x14 single race).

1 Bearing for crankshaft - assemble internally 25x47x14.

1 Bearing for cam shaft 17x40x14.

1 Bearing for primary shaft 17x40x14.

1 Steel bushing for needle cage of secondary shaft-assemble internally.

1 Brass bushing for kick starter shaft-assemble internally.

1 Brass bushing for desmodromic shaft-assemble internally.

1 Cam follower bushing.

1 Brass bushing for preselector shaft assemble externally.

1 Kick starter lever stop plate.

1 Oil tube and seal rubber ring.

1 Lower crankcase centering bushing.

1 Breather tube.

List of bearings installed on right hand half crankcase. (4 speed engine).

For 125cc - 1 Bearing for crankshaft-assemble externally 20x47x14.

1 Bearing for crankshaft-assemble internally 25x47x14.

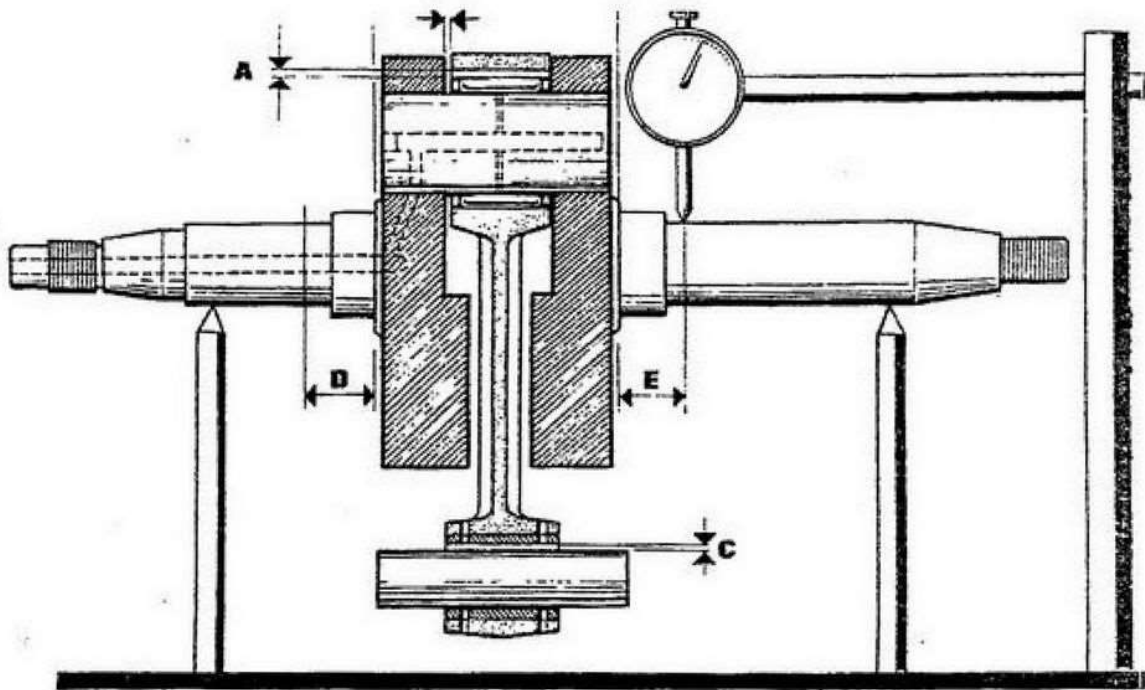
For 200-250cc - 1 Bearing for crankshaft-assemble internally 25x47x14.

1 Spacer externally.

1 Bearing for crankshaft assemble externally 20x47x20,6 double race.

All the other parts bearing and bushing remain unchanged as per 5 speed.

Main bearing assembly 5 speed engine.



11 CRANKSHAFT ASSEMBLY TECHNICAL DATA AND CONTROLLING ECCENTRICITY

A radial play connecting rod

STD.	0,010 ÷ 0,020 .000393" ÷ .000787"
Max allow. Limit	0,050 .001968"

B connecting rod side play

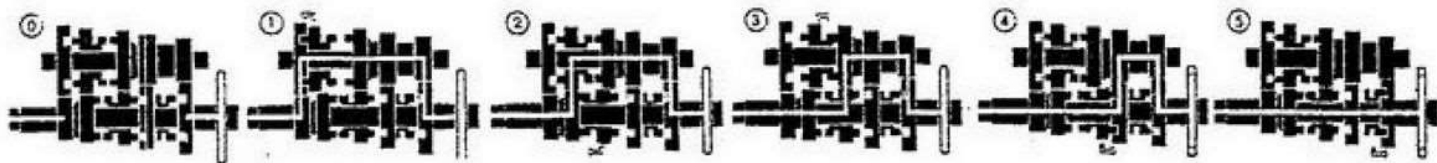
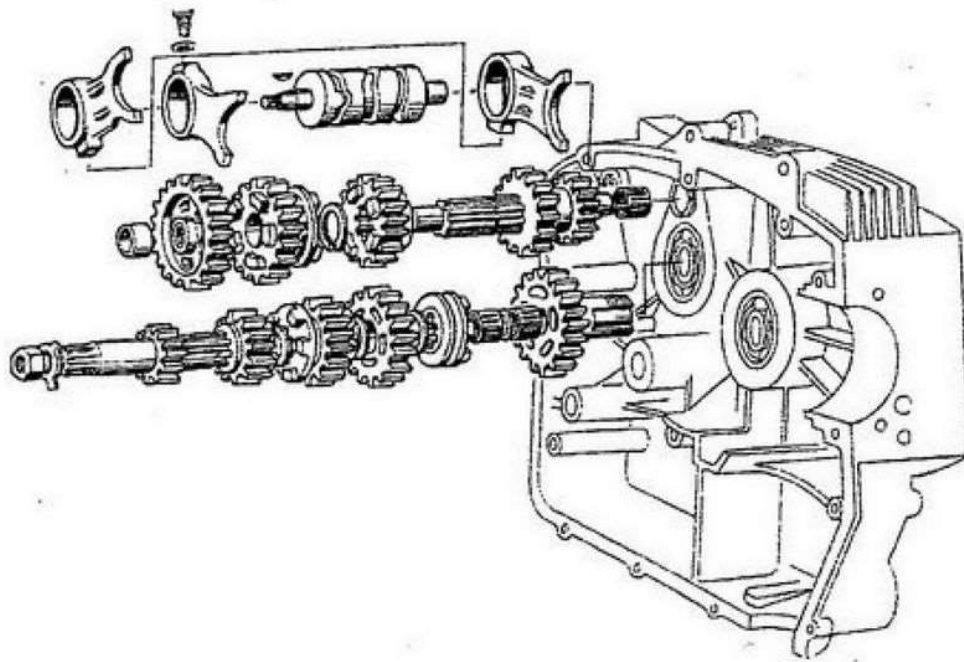
STD.	0,100 ÷ 0,150 .003937" ÷ .005905"
Max allow. Limit	0,400 .01574"

C piston pin play

STD.	0,015 ÷ 0,020 .000590" ÷ .000787"
Max allow. Limit	0,050 .001968"

D-E 20 mm. = (0.787")

Maximum excentricity admissible, measured at the point D-E indicated in the figure 0.020 (.000787")
--



Gear box ratio

For 125-200-250cc.

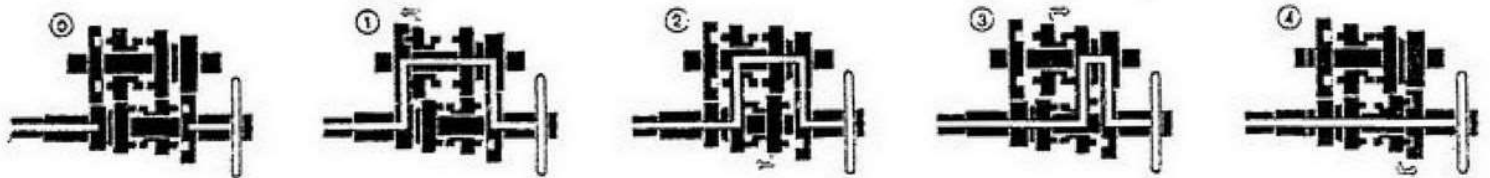
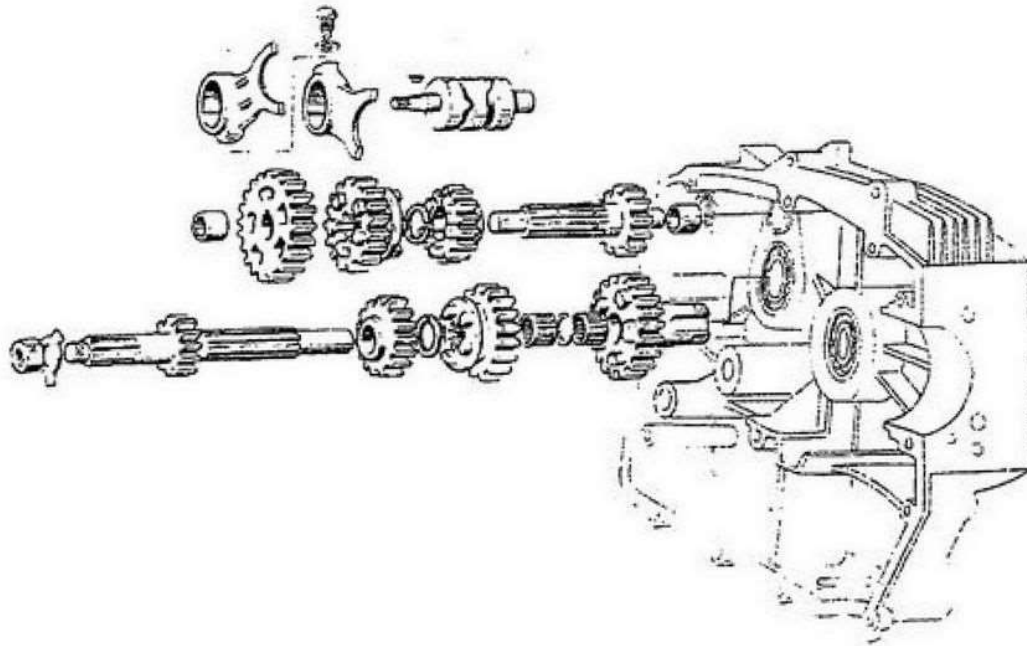
Engine gear box ratio = 3 to 1
 Internal gear box ratio
 1st 3.166
 2nd 2.010
 3rd 1.529
 4th 1.162
 5th 1.000

For 125cc.

Countershaft sprocket = 15 T
 Rear wheel sprocket = 44 T
 Final ratio
 1st 27.857
 2nd 17.685
 3rd 13.453
 4th 10.224
 5th 8.799

For 200-250cc.

Countershaft sprocket = 17 T
 Rear wheel sprocket = 41 T
 Final ratio
 1st 22.899
 2nd 14.538
 3rd 11.059
 4th 8.404
 5th 7.233



Gear box ratio

For 125-200-250cc. Engine gear box ratio = 3 to 1

For 125cc.

Internal gear box ratio

1st 2.683
 2nd 1.665
 3rd 1.267
 4th 1.000

Countershaft sprocket = 15 T
 Rear wheel sprocket = 44 T

Final ratio

1st 23.607
 2nd 14.650
 3rd 11.148
 4th 8.799

For 200-250cc.

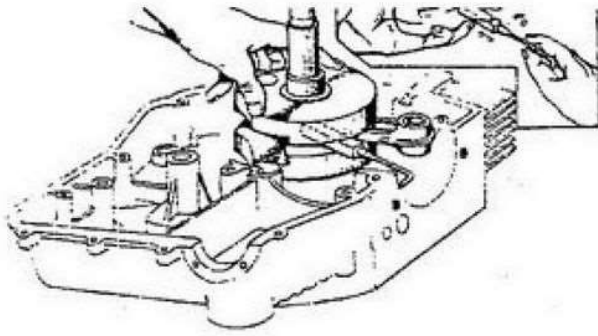
Internal gear box ratio

1st 2.615
 2nd 1.515
 3rd 1.153
 4th 1.000

Countershaft sprocket = 17 T
 Rear wheel sprocket = 41 T

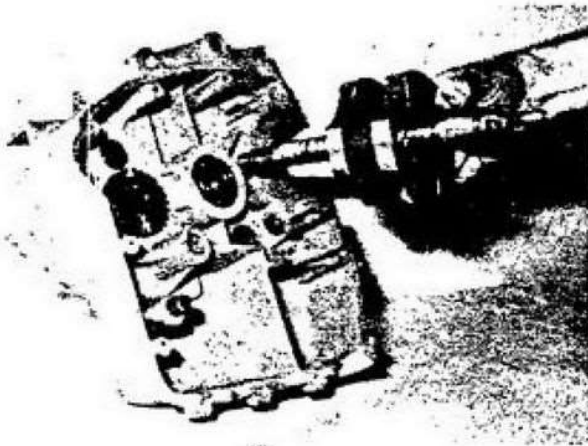
Final ratio

1st 18.914
 2nd 10.957
 3rd 8.339
 4th 7.233



Heat the crankcase at approximately 140° to 180° Fahrenheit before proceeding with the installation of the various groups.

Insert the adjustable special spacer Q in between the two half crankshafts before assembling this group.



Insert in the final gear drive the following:

First needle cage

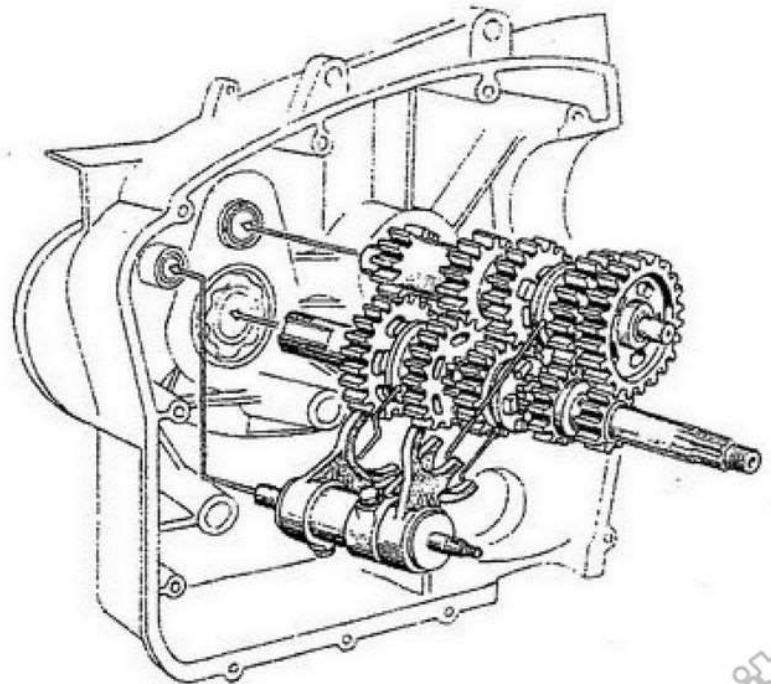
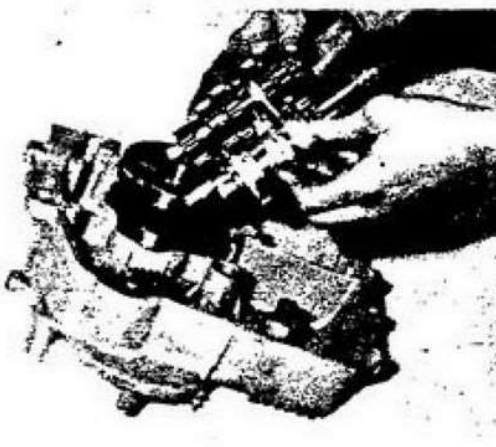
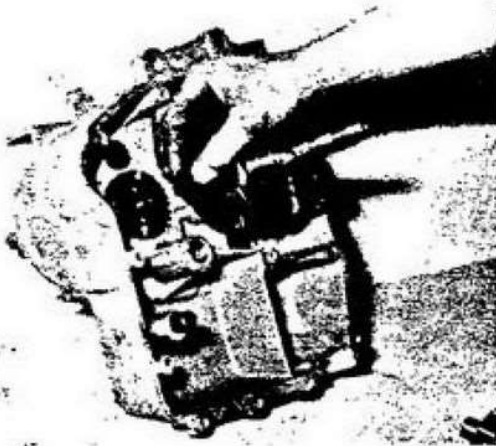
Spacer

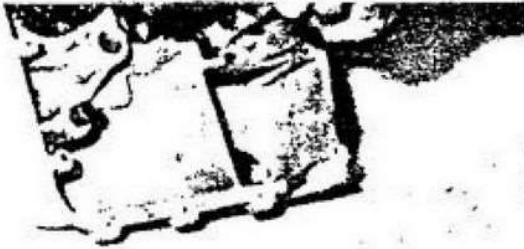
Second needle cage

Insert the needle cage into the steel bushing of the secondary shaft.

Insert the gear box assembly into the proper seats.

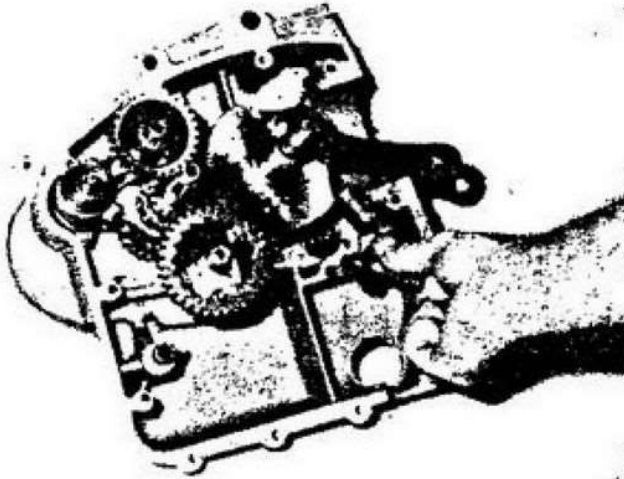
NOTE: For the 4 speed gear box - proceed as per above instructions.



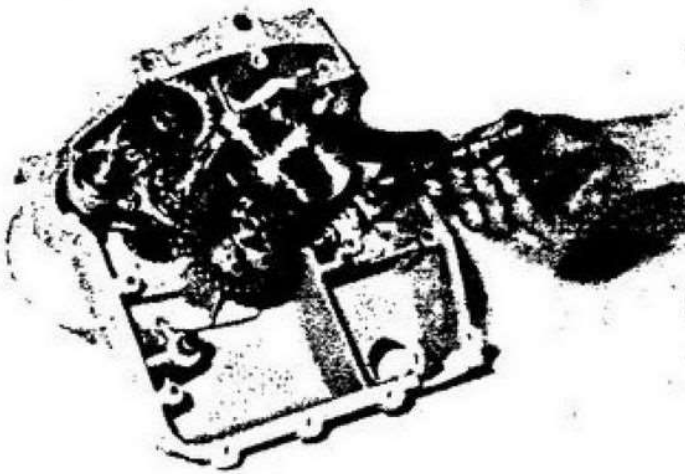


into respective seat of the crankcase. Protect the end of the shaft with a layer of scotch tape.

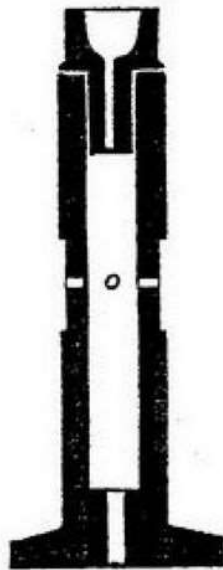
NOTE: Before proceeding to join the right hand crankcase, be sure that the ratchet is facing towards the lower part of crankcase as shown in the picture.



Clean thoroughly the oil passages of the cam follower and insert into the bushing

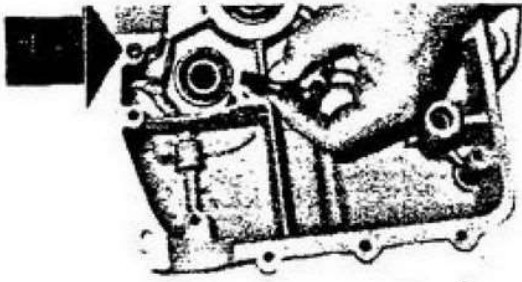


Insert cam.



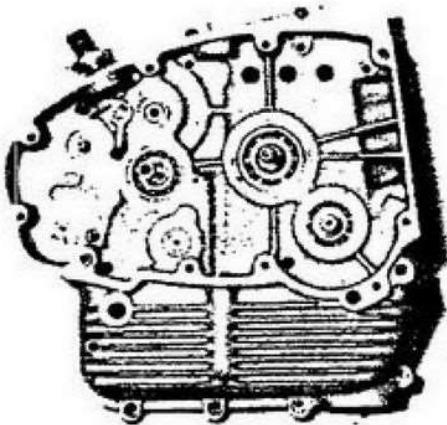
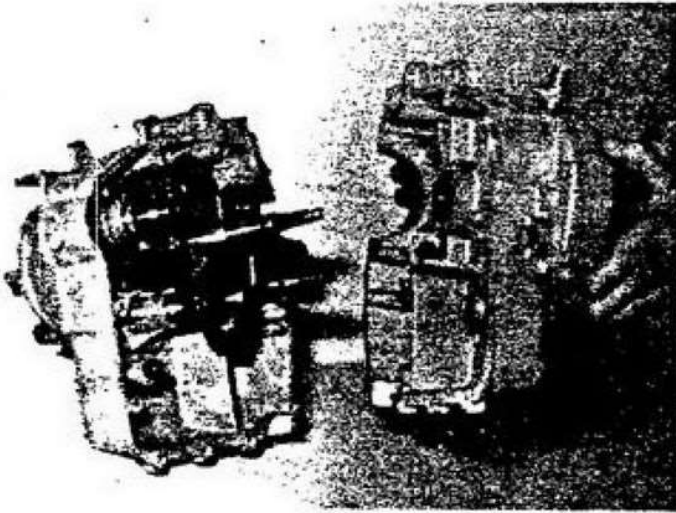
IMPORTANT NOTE

On all engines for Sprites and Barracudas, the cam followers together with the oil passage tubes, play an important part for the lubrication of the valves and rocker arms (see next page) the oil is forced through the cam followers and push rod. This prevents noise and wear to the parts subject to constant pounding force.

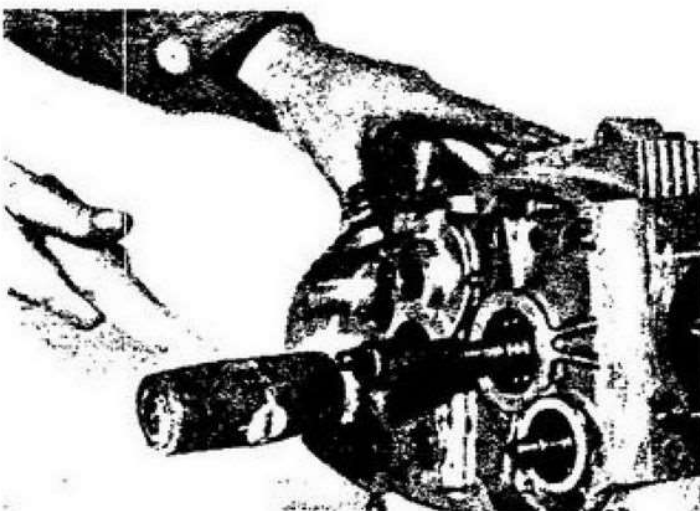


... gently contact on the half crank-
cases contact faces, and assemble the half
case, being careful that all the shafts are
aligned with the respective seats and all
the components are in the proper place.
NOTE

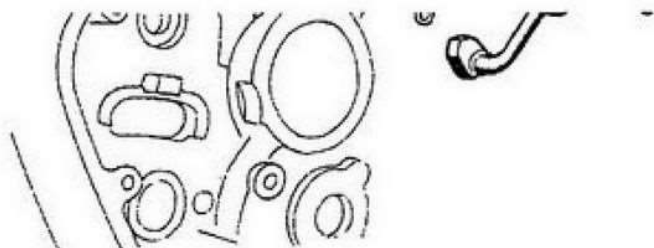
The cam follower shoulder must be against
the bushing and the cam ramps must face
toward the back of the engine.



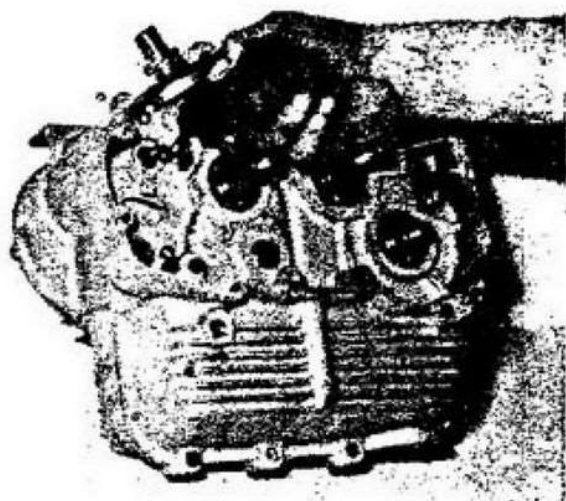
When all the shafts are partially inserted
into the seats, tap slightly and evenly the
half crankcase and completely close.
Insert and tighten evenly (crosswise) all
the screws as shown in Fig. on page 14-15
Assemble the needle cage into the steel
bushing of the secondary shaft and install
the seeger ring.



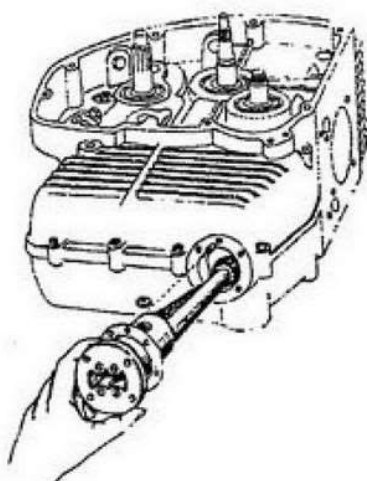
Remove the adjustable spacer Q from the
crankshaft.
Free all the shafts tapping slightly on the
ends with a plastic hammer.



On the right hand cover install the gear stop lever spring, lever and seeger.

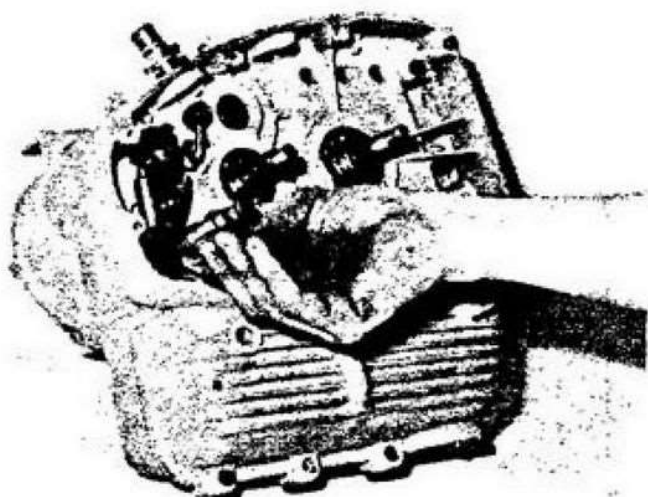


Assemble Woodruff key and shifting drum nut and tighten firmly with 11mm socket wrench.

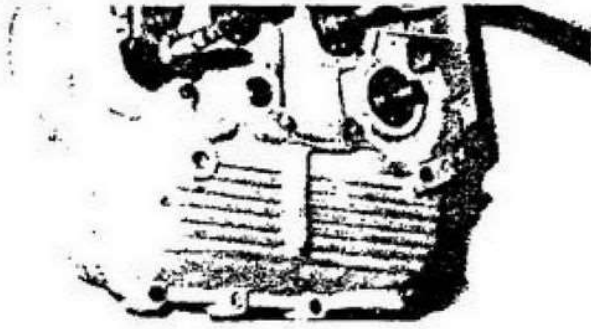


Insert the oil pump rubber ring into the oil pump seat and slide it into the crank case from the bottom.
NOTE: Align the reference hole with the pin of the crankcase.

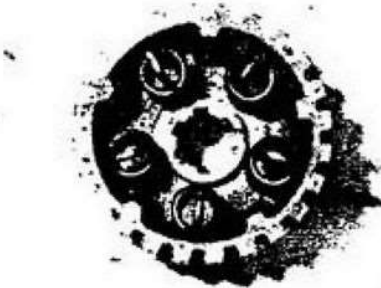
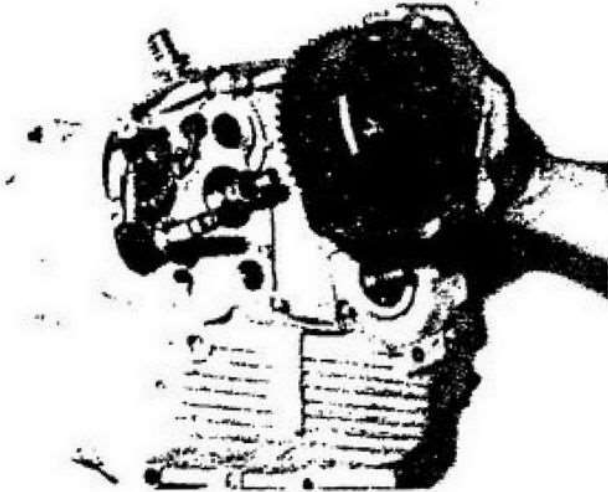
Use gasket cement on the oil pump gasket and the four screws.



Assemble the preselector shaft and thrust washer.

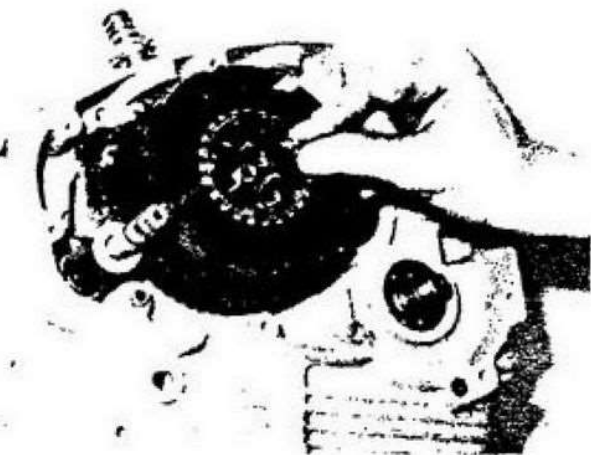


second Trust washer.

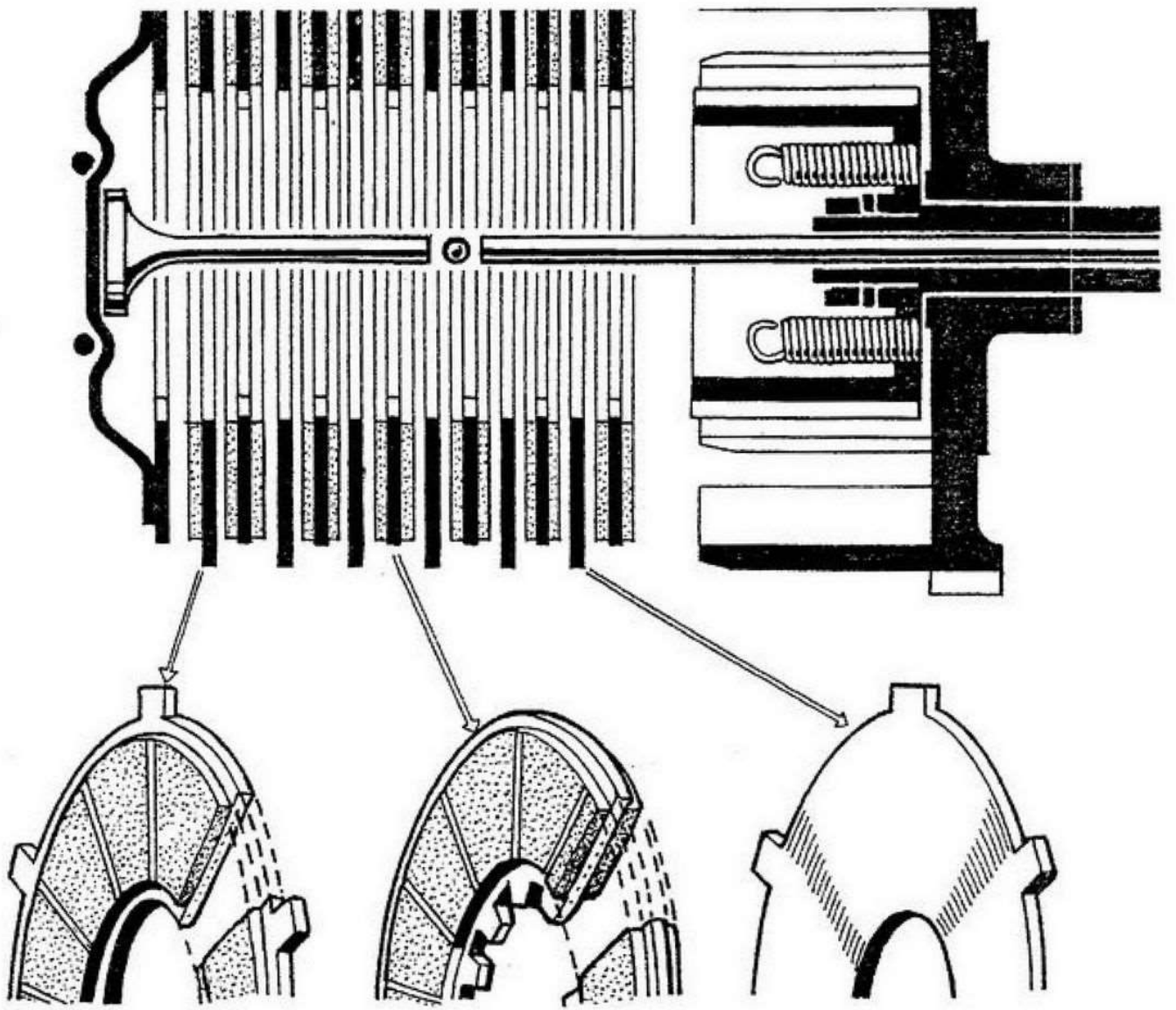


Before assembling the clutch hub, be certain that all the clutch spring hooks are all facing the center and at the same height.

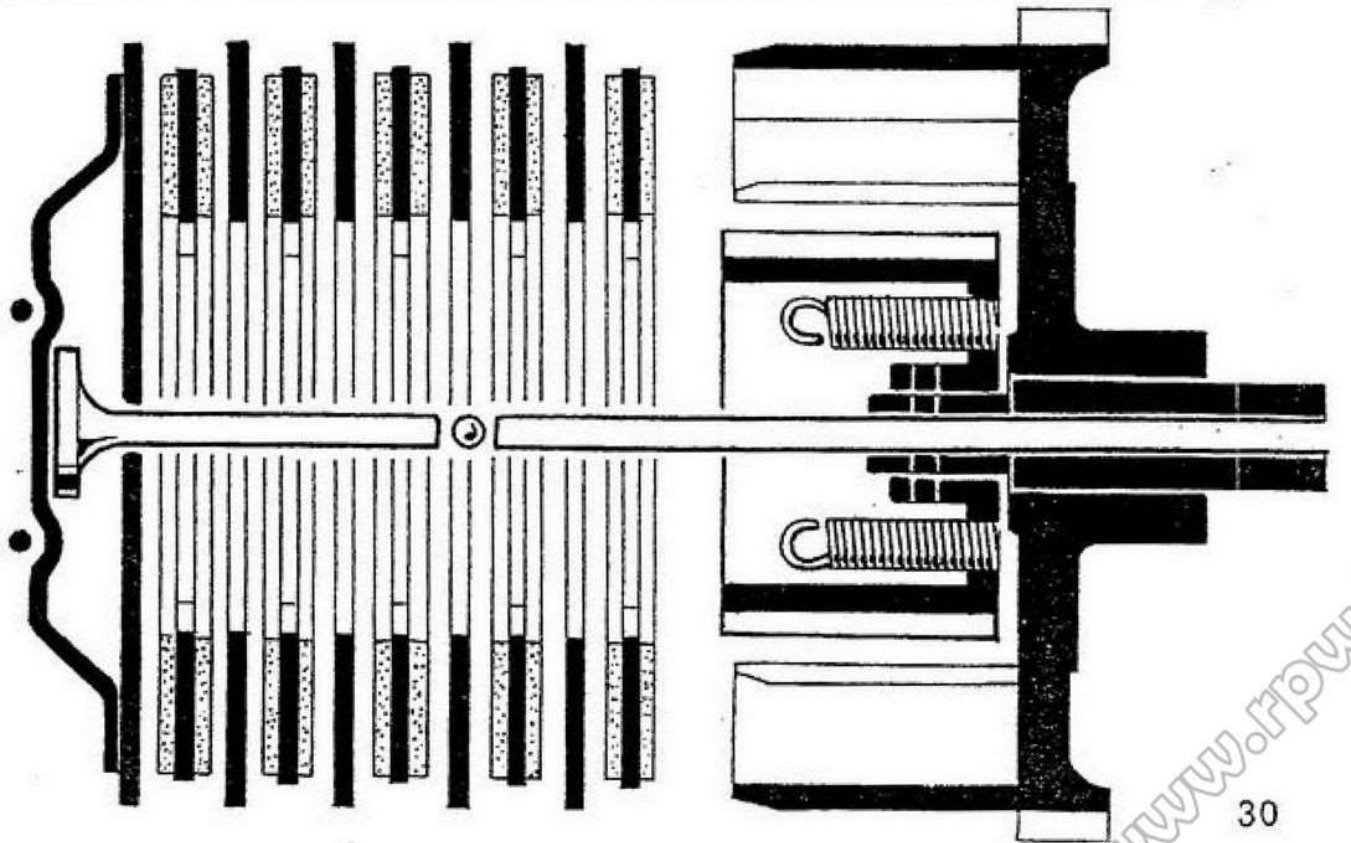
NOTE: It is important that the clutch springs are even with the clutch hub face.

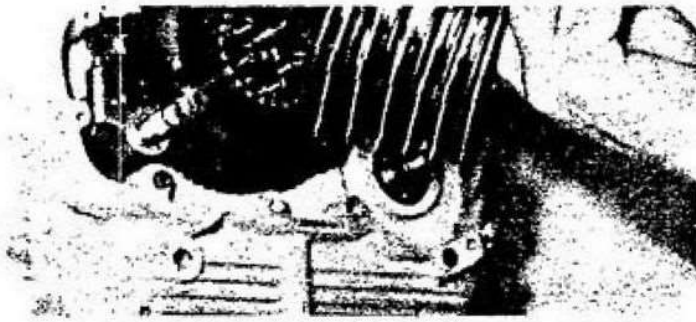


Slide on the primary shaft the clutch hub. Install the safety washer and lock the nut at 45-50 ft. lb. Bend the loop of the safety washer over the locking nut.

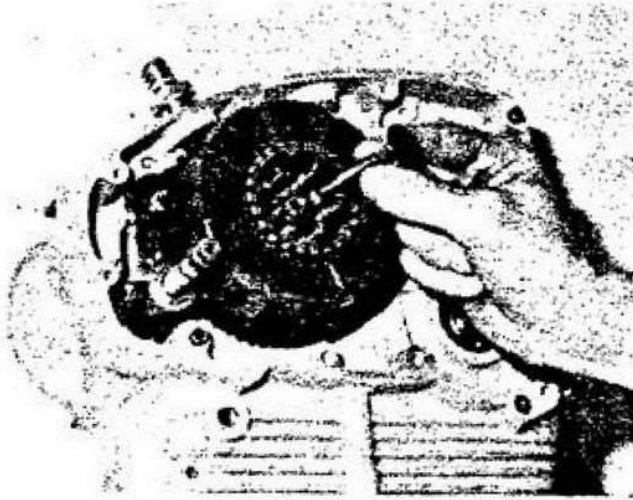


Exploded view of the clutch assembly for 125cc (4) four and (5) five speed engines.

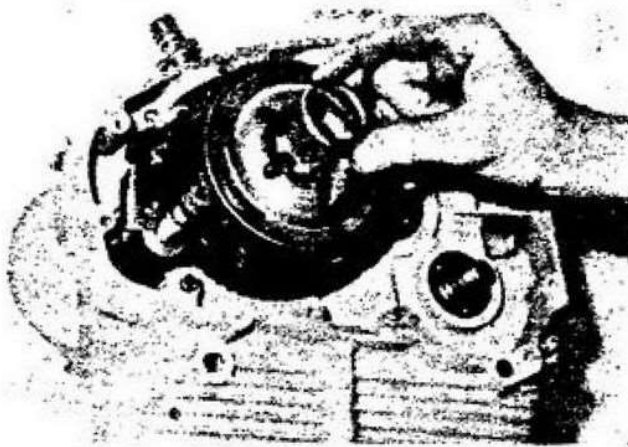




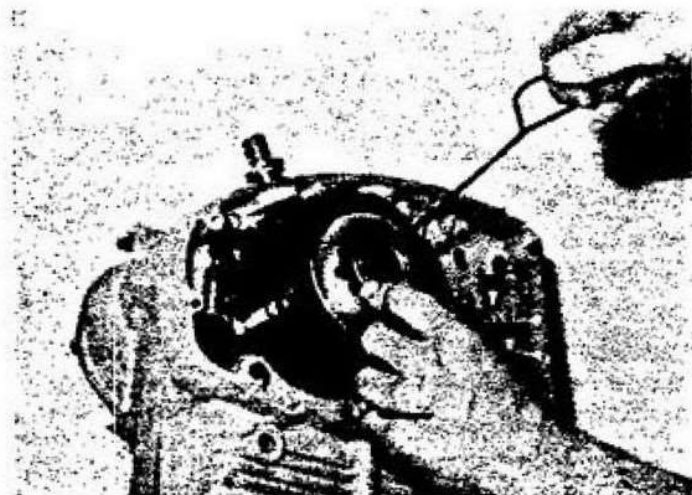
Insert the clutch discs in the proper sequence as shown on page 30



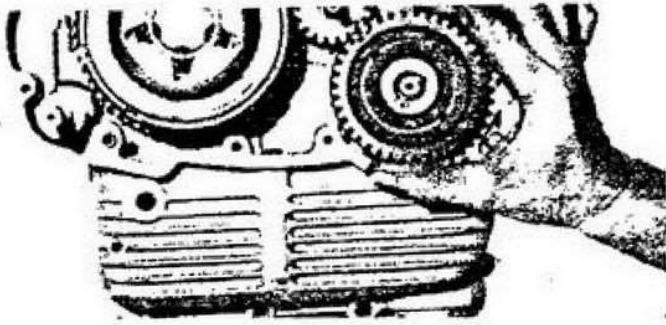
Install the 3/16" ball and the short clutch rod.



Assemble the pressure clutch disc with the slots corresponding to the hooks of the clutch spring.
Set the clutch spring retainer ring on the clutch pressure disc and attach the spring using special tool N.



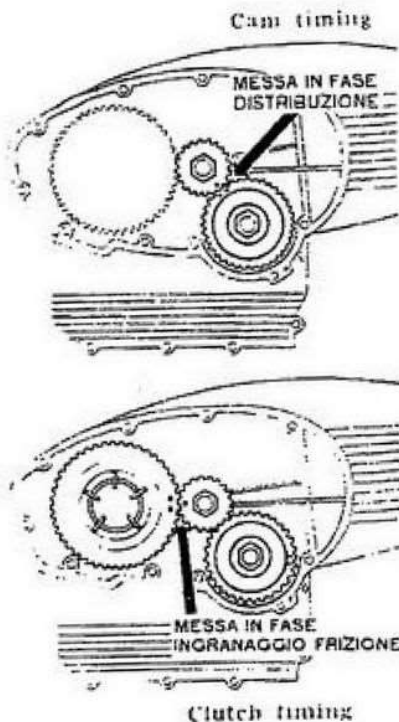
NOTE:
The slot of the clutch spring retainer ring must be placed in the center of two slots of the clutch pressure disc.



Install the Woodruff keys and assemble the two gears, matching the timing marks.

The primary transmission is composed of three helicoidal gears of high precision which are accurately matched by the manufacturer.

The timing of the engine pinion gear with the cam gear determines the distribution of the strokes, while the reference mark of the clutch crown is to set the gear in the same position, to avoid any gear noise.



Procedure of distribution timing.

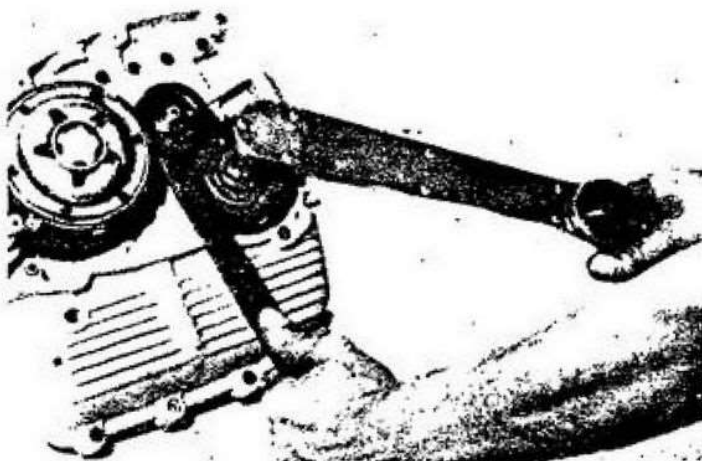
Install engine pinion gear.

Match mark (dot) of engine pinion gear with the dots of clutch crown.

Rotate crankshaft clockwise until the Woodruff key slot reaches 4 o'clock position.

Turn cam shaft until the key reaches about 3 o'clock position.

Match the dot of engine pinion gear with two dots of cam gear.

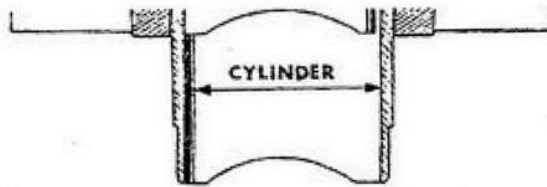


NOTE: When installing the cam gear, be certain that Woodruff key matches the key slot of the gear.

Install the gears nuts and tighten at 45-50 ft. lb. using the special tool F. To hold pinion gear.

Assemble the locking nut and tighten at 40-45 ft. lb.

Install the 4 cylinder head studs using a nut and lock nut.



Piston with indicative measurement for each model.

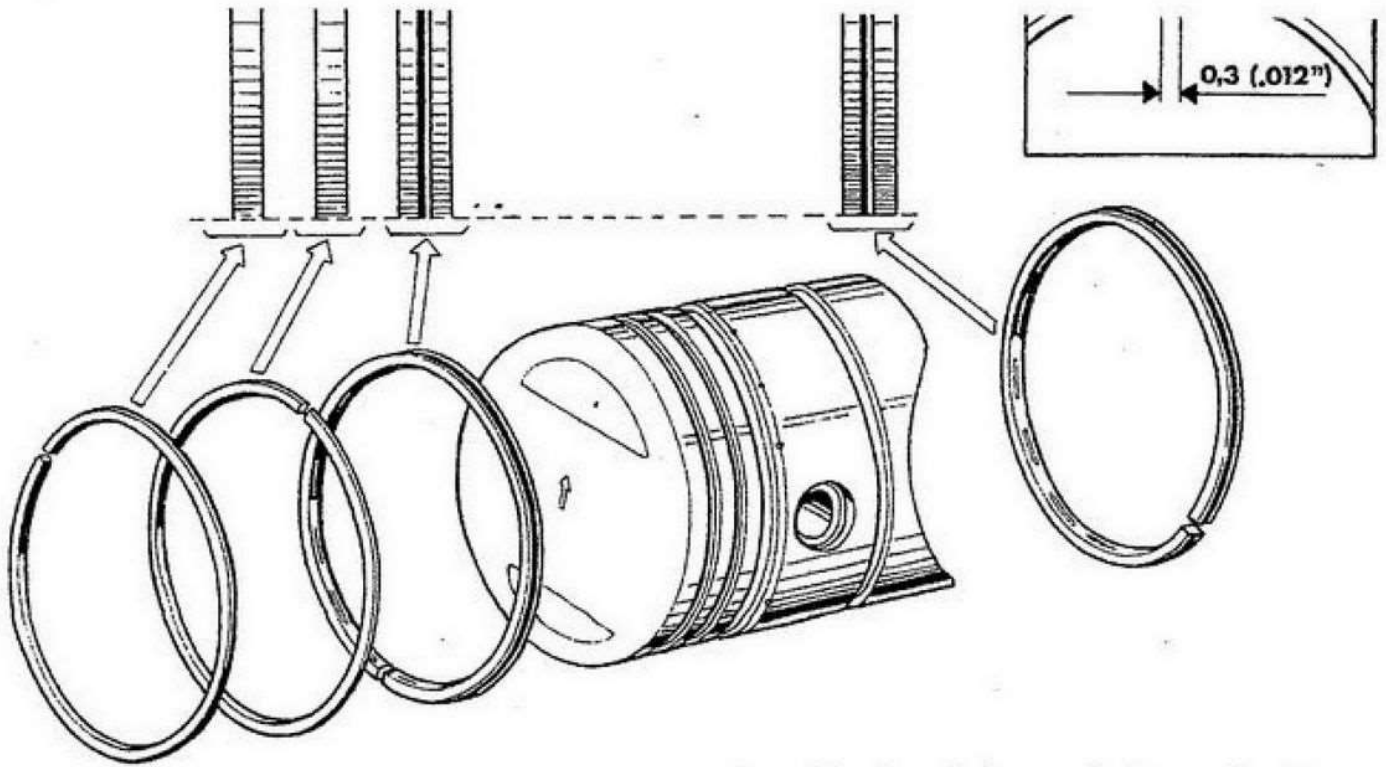
15 CYLINDER-PISTON TECHNICAL DATA

125 cc. Grading	Cylinder	Piston	Play on assembly (°)		Play at limit of wear	
			Min.	Max.		
New	54 (2.1259") Selection: A } 0 +0,010 (.000393") B } +0,010 (.000393") +0,020 (.000787") C } +0,020 (.000787") +0,030 (.001181")	54 (2.1259") Selection: A } -0,030 (.001181") -0,040 (.001574") B } -0,020 (.000787") -0,030 (.001181") C } -0,010 (.000393") -0,020 (.000787")	0,030 (.001181")	0,050 (.001968")	0,120 (.004724")	
	1st oversize	54,2 (2.1338")				54,2 (2.1338")
	2nd oversize	54,4 (2.1417")				54,4 (2.1417")
	3rd oversize	54,6 (2.1496")				54,6 (2.1496")
			As per STD	As per STD	As per STD	

200 cc. Grading	Cylinder	Piston	Play on assembly (°)		Play at limit of wear	
			Min.	Max.		
New	66,5 (2.6181") Selection: A } 0 +0,010 (.000393") B } +0,010 (.000393") +0,020 (.000787") C } +0,020 (.000787") +0,030 (.001181")	66,5 (2.6181") Selection: A } -0,035 (.001378") -0,045 (.001772") B } -0,025 (.000984") -0,035 (.001378") C } -0,015 (.000590") -0,025 (.000984")	0,035 (.001278")	0,055 (.002165")	0,150 (.005905")	
	1st oversize	66,7 (2.6259")				66,7 (2.6259")
	2nd oversize	66,9 (2.6338")				66,9 (2.6338")
	3rd oversize	67,1 (2.6417")				67,1 (2.6417")
			As per STD	As per STD	As per STD	

250 cc. Grading	Cylinder	Piston	Play on assembly (°)		Play at limit of wear	
			Min.	Max.		
New	74 (2.9133") Selection: A } 0 +0,010 (.000393") B } +0,010 (.000393") +0,020 (.000787")	74 (2.9133") Selection: A } -0,045 (.001772") -0,055 (.002165") B } -0,035 (.001378") -0,045 (.001772")	0,045 (.001772")	0,065 (.002559")	0,150 (.005905")	
	1st oversize	74,2 (2.9212")				74,2 (2.9212")
	2nd oversize	74,4 (2.9291")				74,4 (2.9291")
	3rd oversize	74,6 (2.9370")				74,6 (2.9370")
			As per STD	As per STD	As per STD	

NOTE: On the cylinder the selection letters A-B-C are stamped on the Upper Face. The selection letters A-B-C of the piston are stamped on the piston top.



Assemble the oil ring and piston ring in the sequence as shown in Fig.

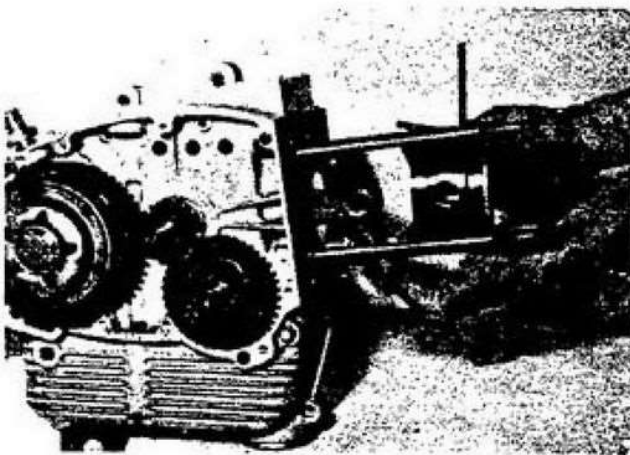


Assembly of the piston

Before assembly, check for wear (see technical date).

Install the piston rings on piston.

Install the piston pin into the piston hub and slide it into the special tool C.

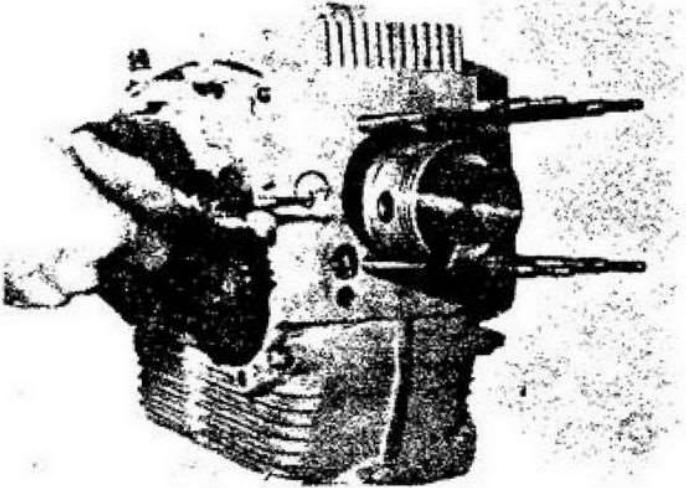


Lift the connecting rod and at the same time, slide the special tool through the cylinder studs until the piston pin is in alignment with the connecting rod bushing. Insert the guiding pin B at the opposite end of the piston pin.

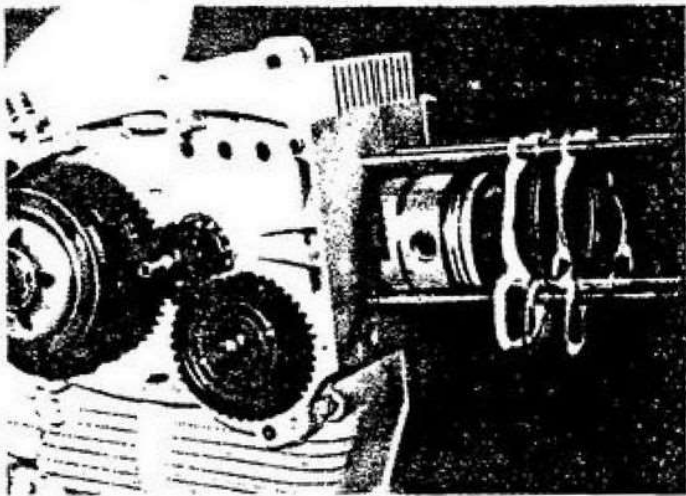


Turning the spindle of the tool, drive in the piston pin until it is level with the circlip groove.

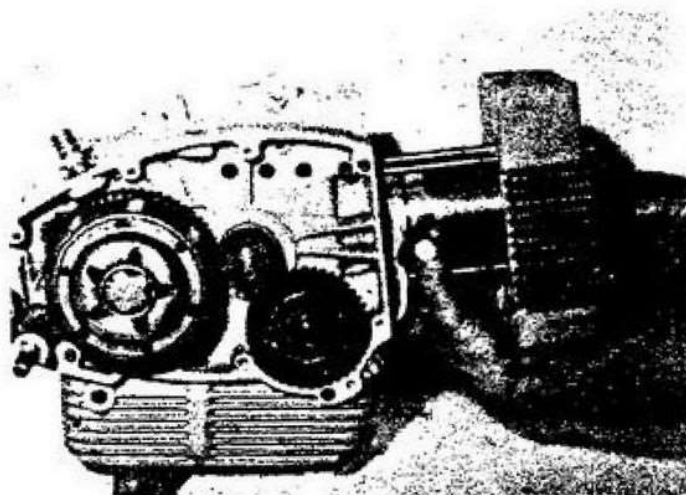
It is advisable to heat the piston at 100°-120° Fahrenheit before the installation of the piston pin.



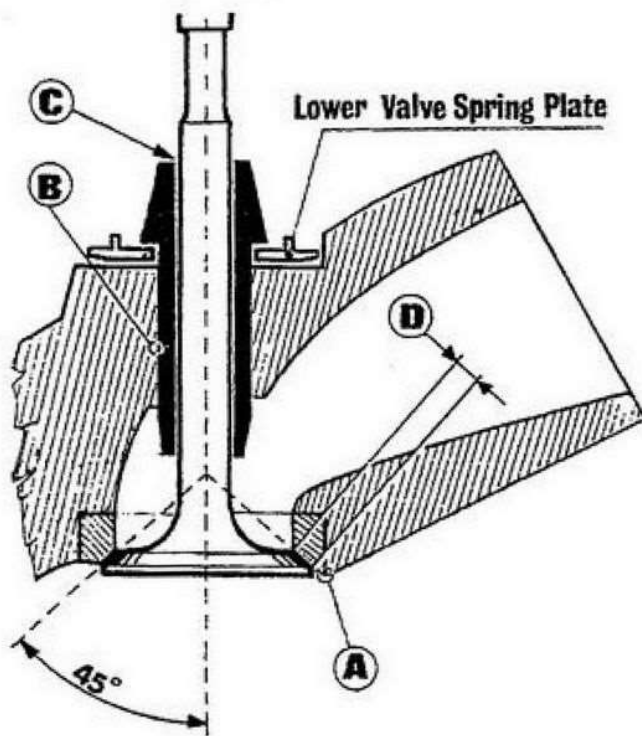
Use needle nose pliers to install circlips.



Install one thin paper gasket, special alloy gasket and a second thin paper gasket before assembling the cylinder.



Lubricate the piston and cylinder wall. Assemble cylinder while pressing the rings with fingers in order to facilitate the installation.



A Valve seat press. interference for exhaust-intake

125 cc. Intake \ Min. 0,35 (.013779")
 / Max. 0,40 (.015748")

200-250 cc. Intake \ Min. 0,30 (.011811")
 / Max. 0,35 (.013779")

B Valve guide press. interference for exhaust-intake

125-200-250 cc. Intake \ Min. 0,03 (.001181")
 / Max. 0,05 (.001968")

C Play between valve and valve guide

Intake \ Min. 0,01 (.000393")
 / Max. 0,035 (.001377")
 STD. 125 cc. \ Max. allow limits
 / 0,1 (.003937")

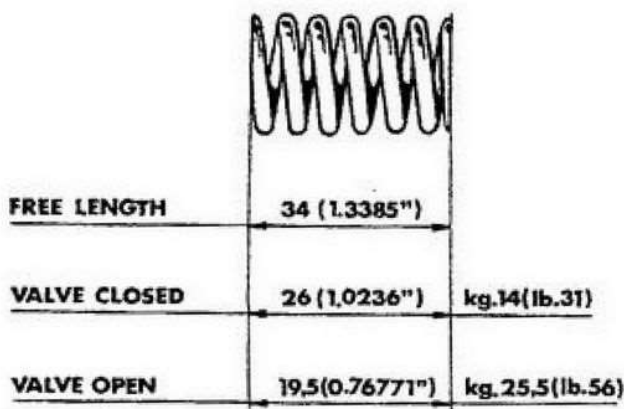
Exhaust \ Min. 0,02 (.000787")
 / Max. 0,045 (.001771")

STD. 200-250 cc. \ Min. 0,02 (.000787")
 Intake-Exhaust / Max. 0,045 (.001771")
 Max. allow limits
 / 0,1 (.003937")

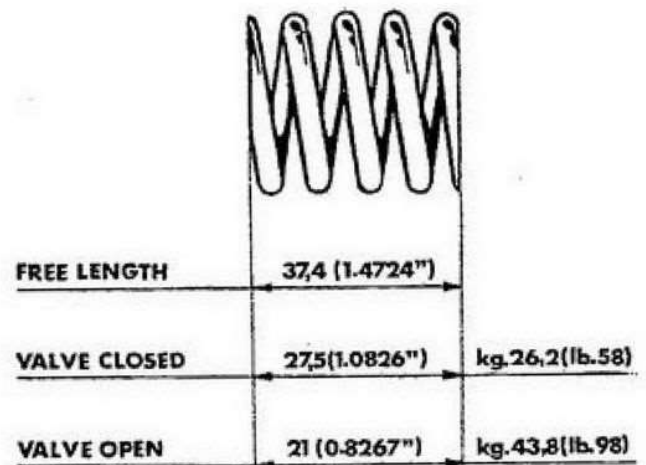
D Valve seat width

STD 125-200-250 cc. Intake-Exhaust 2,1 (.082677")
 Max allowable limit 3,2 (.125984")

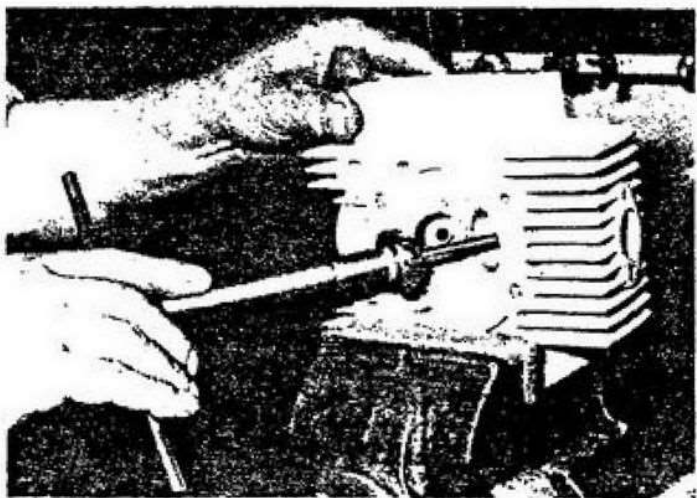
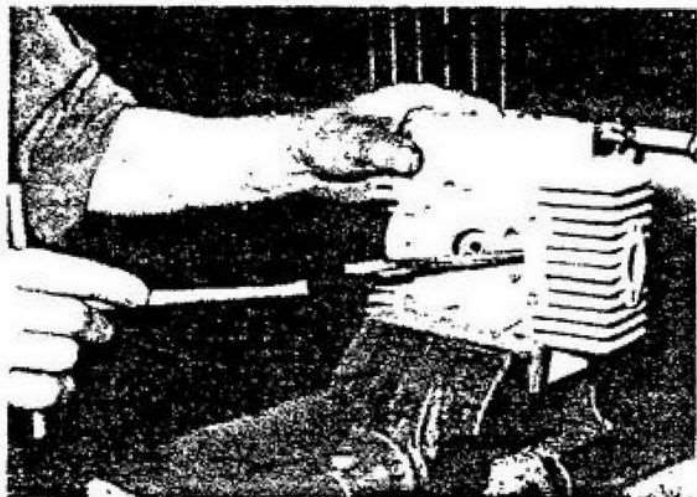
Outer valve spring STD.



Inner valve spring STD.



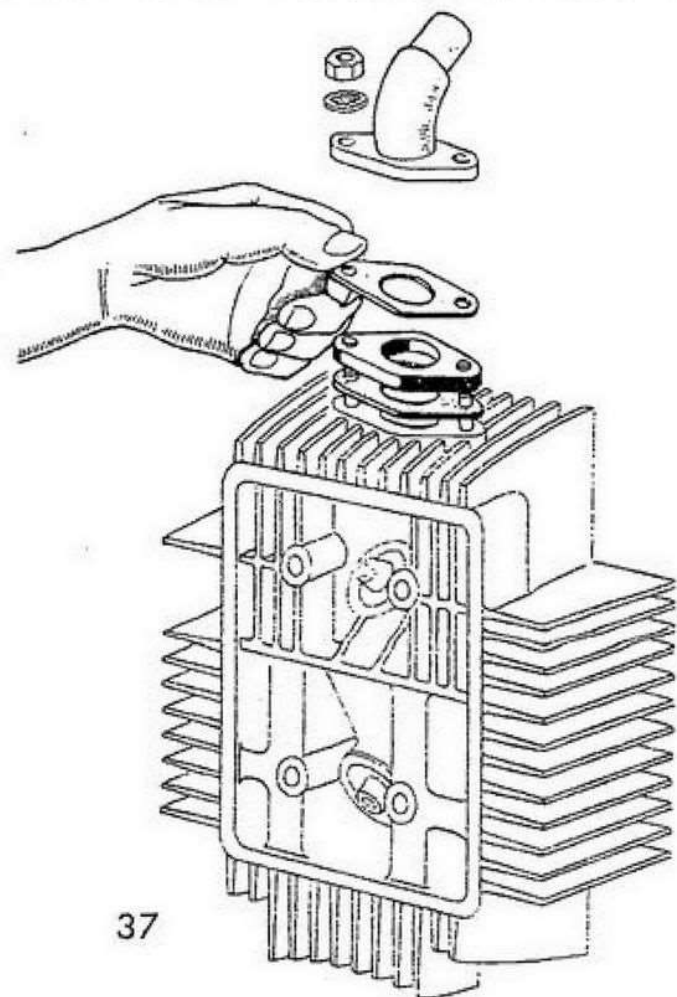
Max. allowable limit (pressure loss.) 25% ~ of the standard pressure.



To install the valve seat, it is necessary to pre-heat the cylinder head at 380° - 420° Fahrenheit and press in the valve seat using special tool.

To remove and install the valve guide, pre-heat the cylinder head at 220° - 260° Fahrenheit.

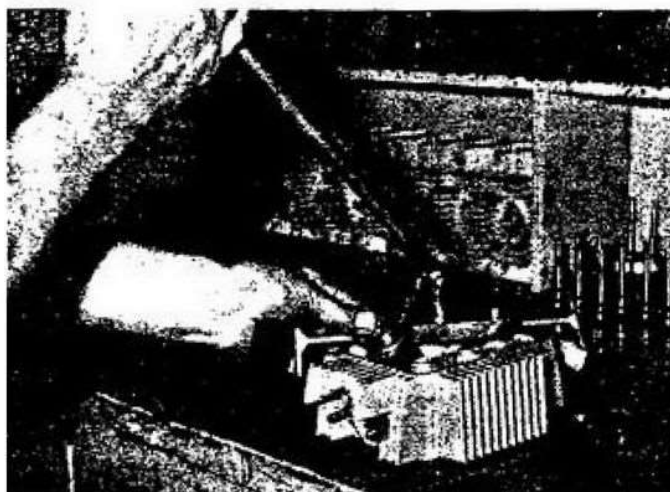
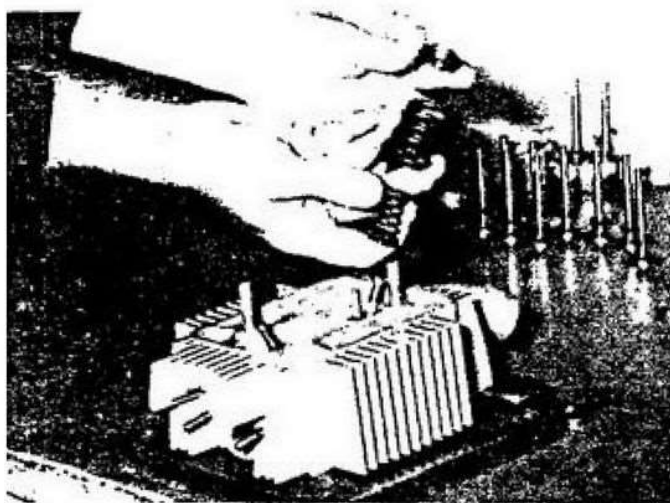
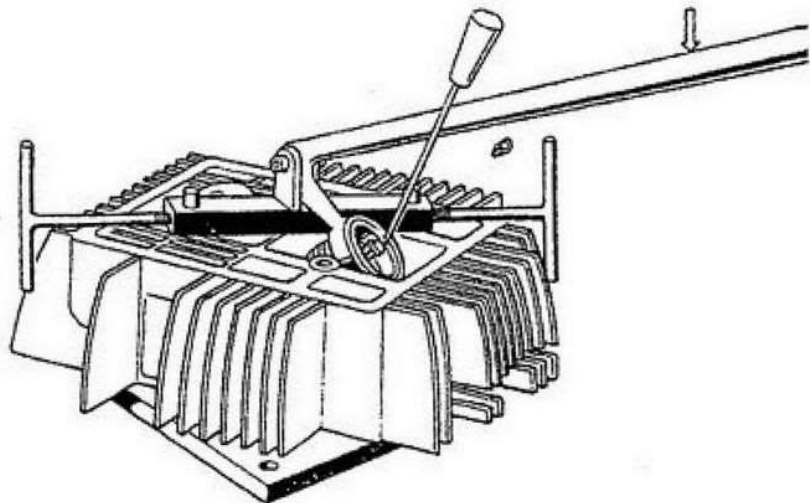
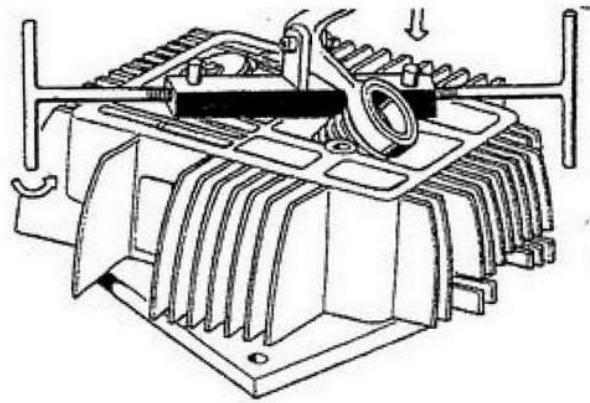
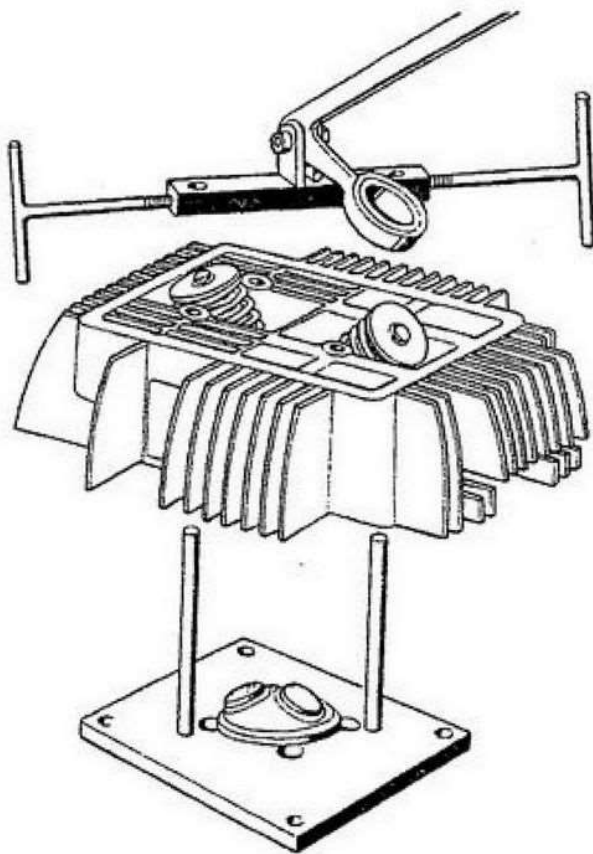
Hold the cylinder head in the vise and using the special 45° valve seat cutter, make a 0.60" wide ring, for the perfect coupling with the valve.



Proceed to lap the valve seat with valve, using fine grinding compound.

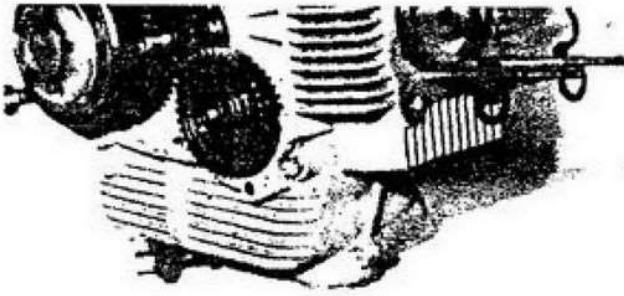
Wash thoroughly the cylinder head, and with the special tool, or with nut and counter lock nut, install the intake manifold and exhaust pipe studs.

Install the intake manifold gaskets in sequence as shown in the picture alongside. Assemble the manifold (facing the back of the engine) and with 10mm wrench, lock the two nuts.

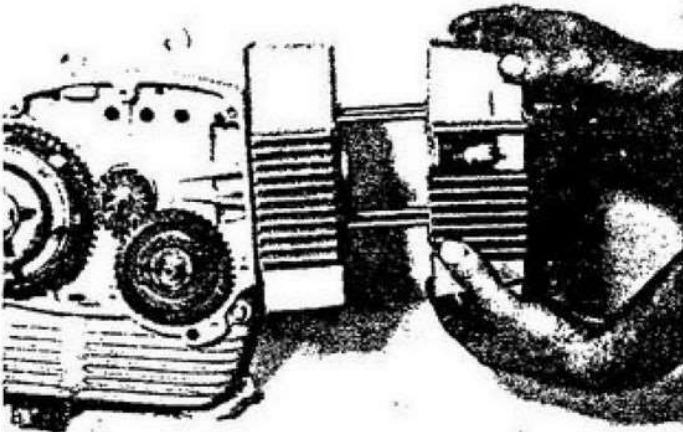


To install valve and valve spring, it is necessary to use the valve spring compressor. Install the valve springs and upper spring plate. Compress the valve spring with tool until you are able to insert the valve keepers.

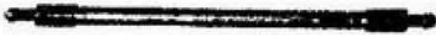
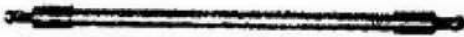
For valve spring technical data see page 36



Assemble the special rubber gasket.



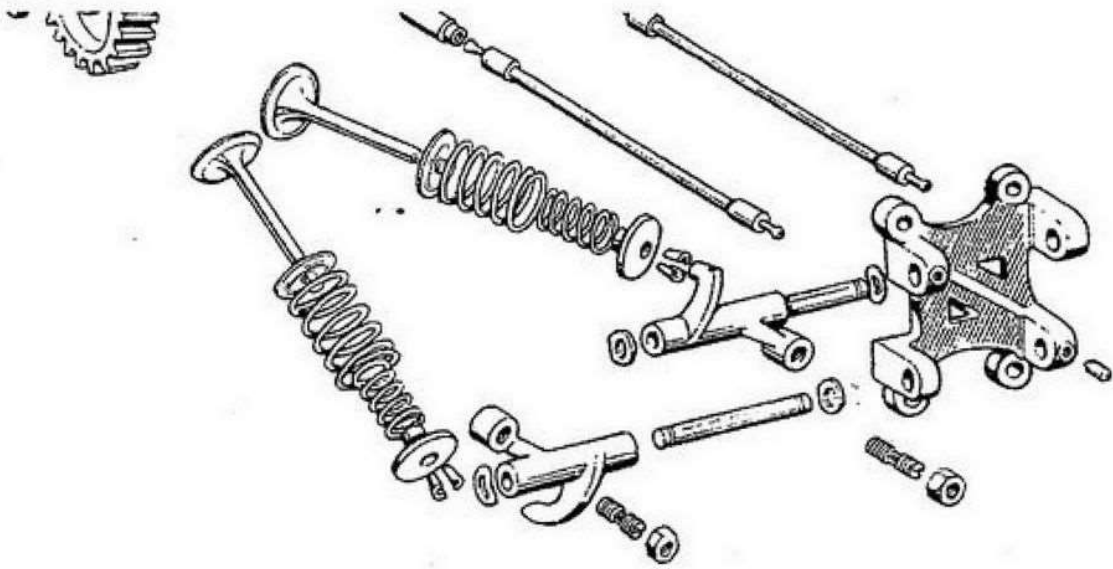
Slide the cylinder head in proper position. Insert the valve push rods in proper places. NOTE: The position of the intake push rod (long push rod), is to the right, facing the front of the engine, while the short push rod (exhaust) is to the left.



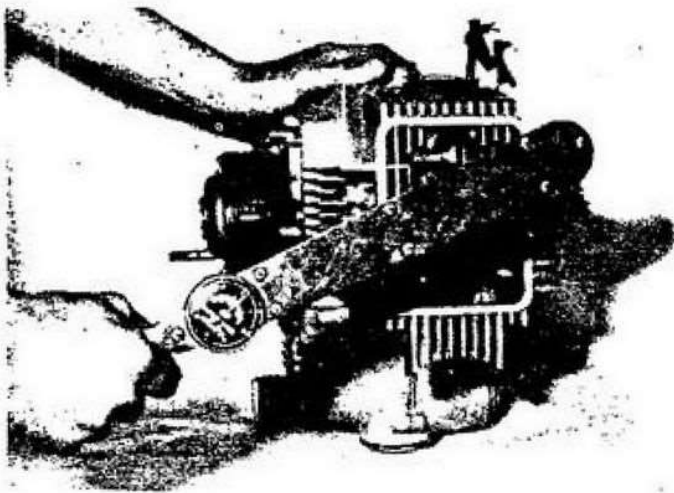
NOTE: The top rocker arm (intake) has an oil passage hole, therefore, before the installation, be certain that this opening is free of any obstruction.



Install the rocker arm support.



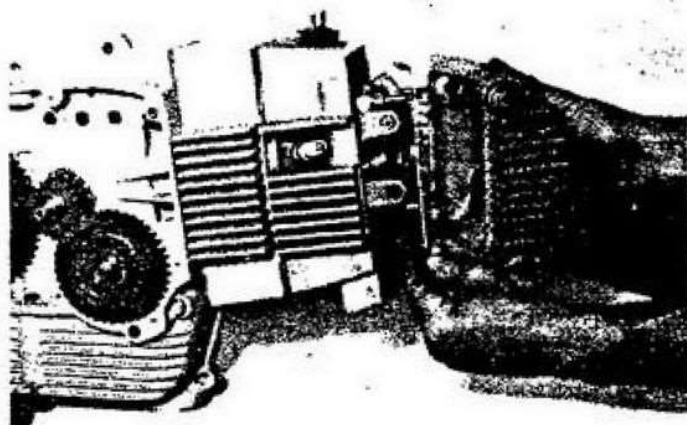
VIEW OF THE CAM SHAFT - VALVE TRAIN



Tighten the 4 cylinder head locking nuts evenly crosswise at 22 - 24 ft. lb.
Turn engine until the piston reaches the T. D. C. position (compression stroke).

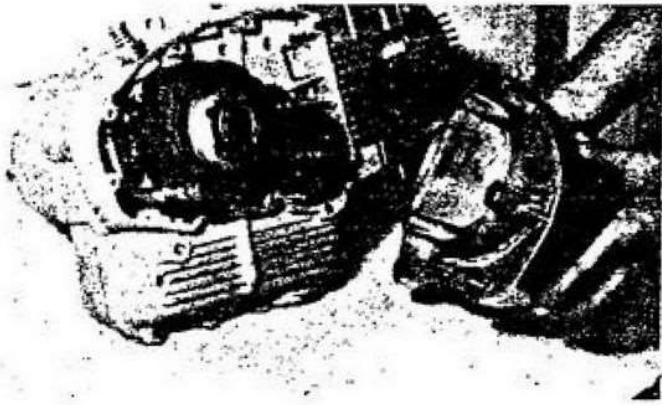
With Hot engine
Intake .005"
Exhaust .005"

With cold engine
Intake valve .006"
Exhaust valve .006"



Install the rocker arm cover aluminum gasket and assemble the rocker box cover. Install in sequence - aluminum washer, steel flat washer and tighten the 4 nuts at 7-8 ft. lb.

NOTE: Protect all the openings of the engine in order to prevent any dust particles from entering.

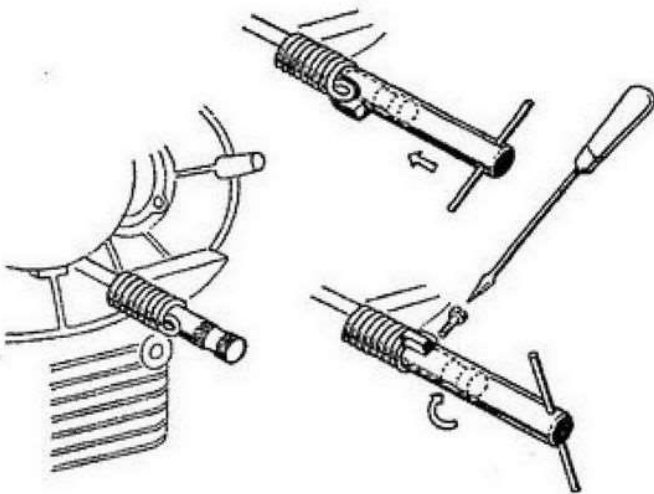


NOTE: Maximum attention must be given to the oil seal and oil opening of the cover, as this carries the oil to the connecting rod.

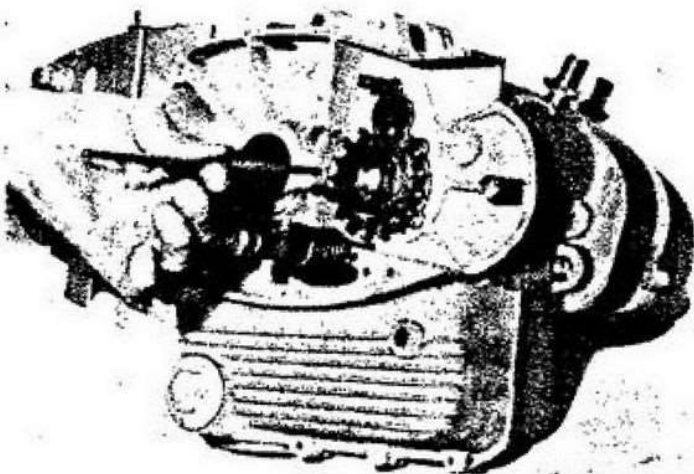
Insert the oil retaining ring in the proper seat on right hand half crankcase.

Insert the cover centering bushing. Spread the gasket cement on the cover contact face and assemble, tightening the screw crosswise, as shown on page 14-15

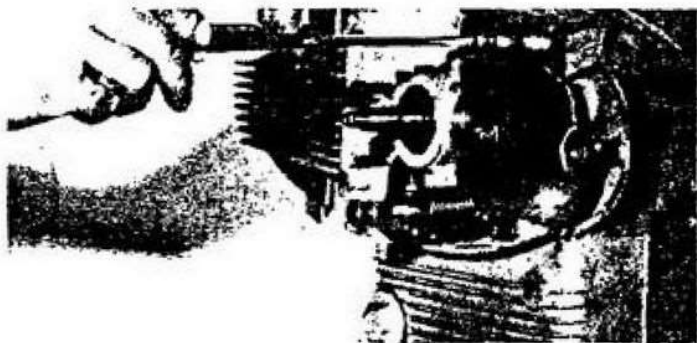
19 COMPONENT ASSEMBLE ON LEFT HAND SIDE (flywheel magneto)



Assemble the kick starter spring using the special tool R.

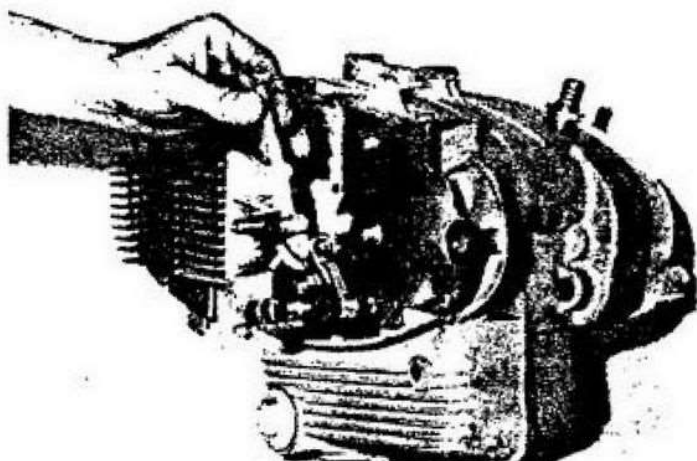


Install the long clutch rod, with the flat side facing inside.

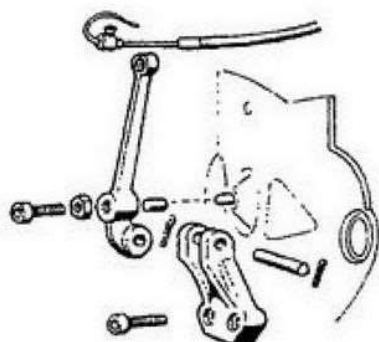


Install the rubber gromet on dust cover and assemble.

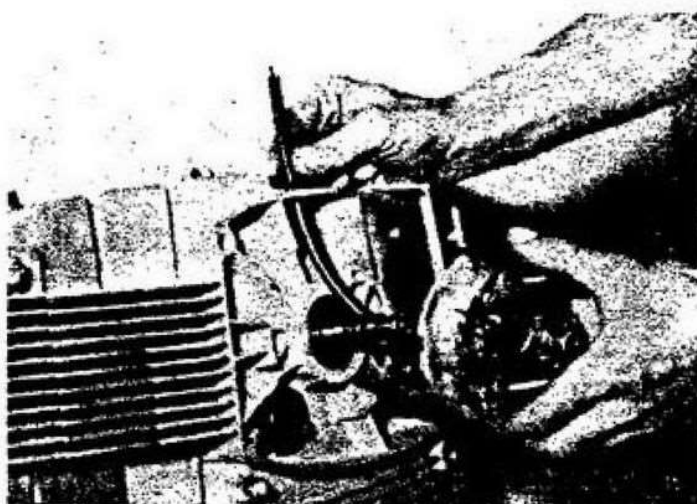
(It is advisable to install the rear chain on the countershaft sprocket before assembling the dust cover).



Install the clutch support lever complete with respective roller.

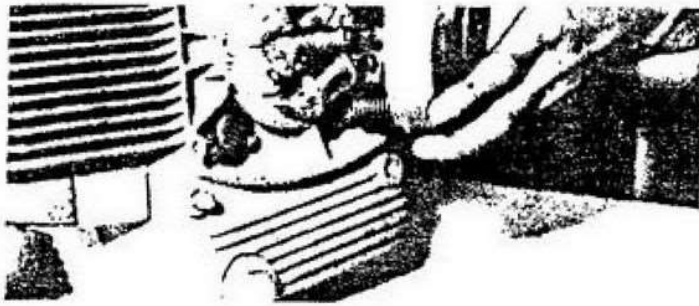


Before locking the two screws, align the center of the roller with the clutch push rod.

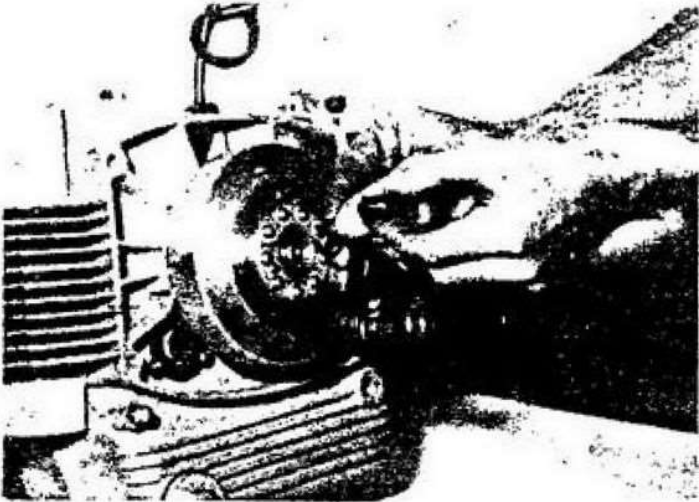


Insert the electrical wire through the rubber ring and slide the back of plate in position, aligning the two marks made during the disassembly operation.

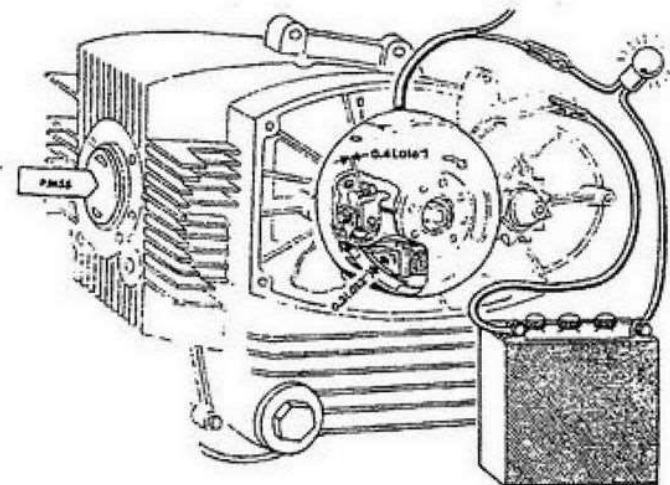
Lock the backing plate with the 3 screws as indicated on page 7



Insert the Woodruff key on the crankshaft and install the flywheel magneto nut.



Assemble flywheel, washer nut and tighten slightly.



20 TO TIME IGNITION PROCEED AS FOLLOWS:

Turn the flywheel until the mark O stamped on the perimeter of the flywheel magneto, matches with the mark O stamped on the crankcase.

Adjust point at .016".

Connect the timing light to the wire of the flywheel magneto (timing light bulb off). Turn flywheel magneto slowly counterclockwise until the timing light goes on.

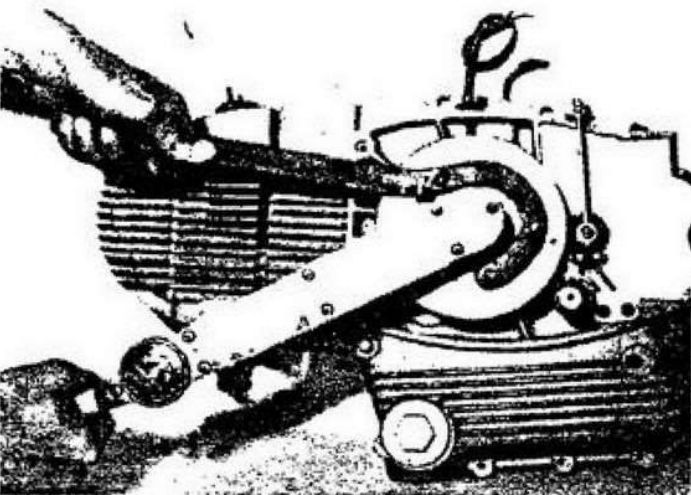
At this position the flywheel magneto mark A (marked on the perimeter of flywheel) must coincide with the mark O of the crankcase.

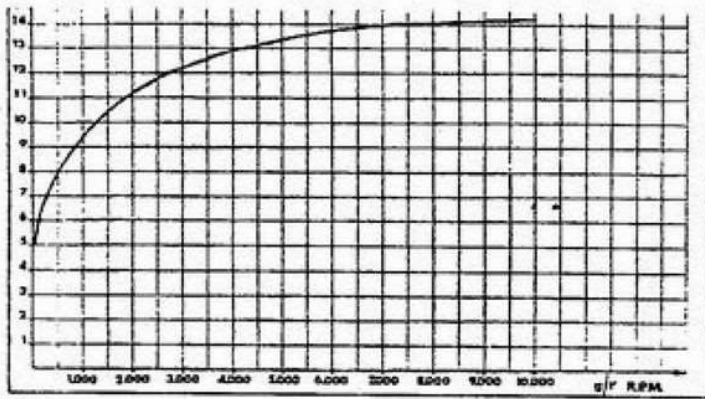
To retard ignition, turn the backing plate clockwise. To advance ignition, turn the backing plate counterclockwise. For this operation it is necessary to remove the flywheel and loosen the 3 backing plate locking screws. This procedure must be repeated until the specified timing is reached.

IMPORTANT

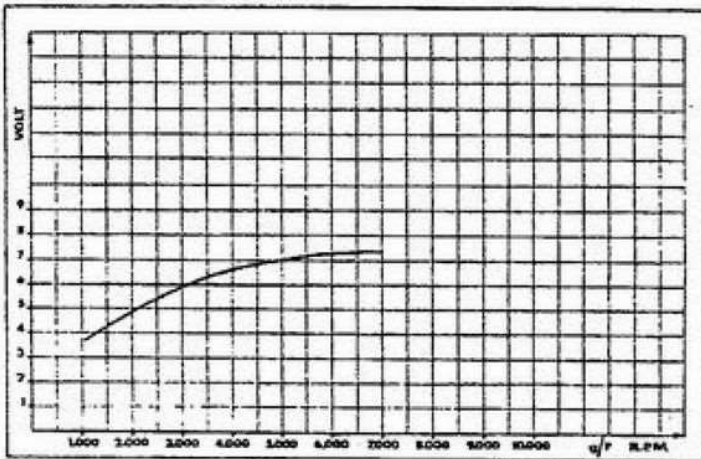
Tighten the flywheel magneto nut at 55-60 ft. lb. Holding the flywheel with tool I.

Install the cover center bushing and firmly tighten with the 3 screws of the cover.

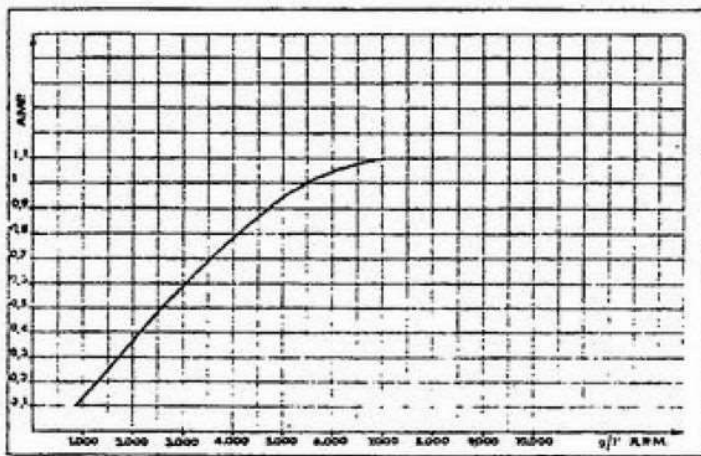




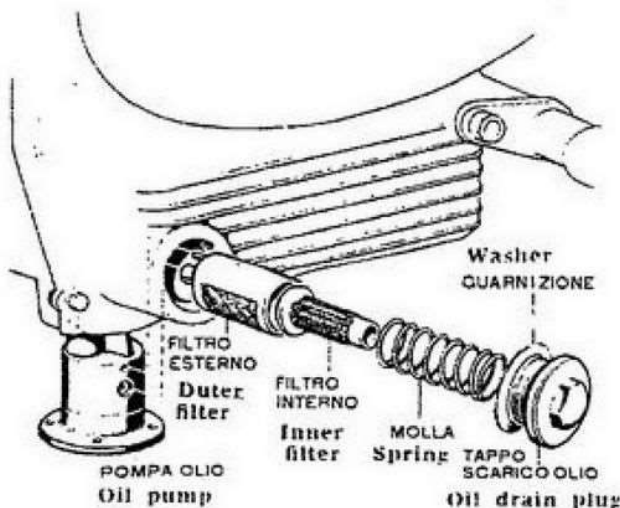
Length of spark in relation of engine R.P.M.
(for all engines).



Voltage in relation of engine R.P.M.
measured at the bulb terminal (for all
engines).



Charging rate in relation of Engine R.P.M.
(Battery SAFA 3V2-8Ah) (For all engines).

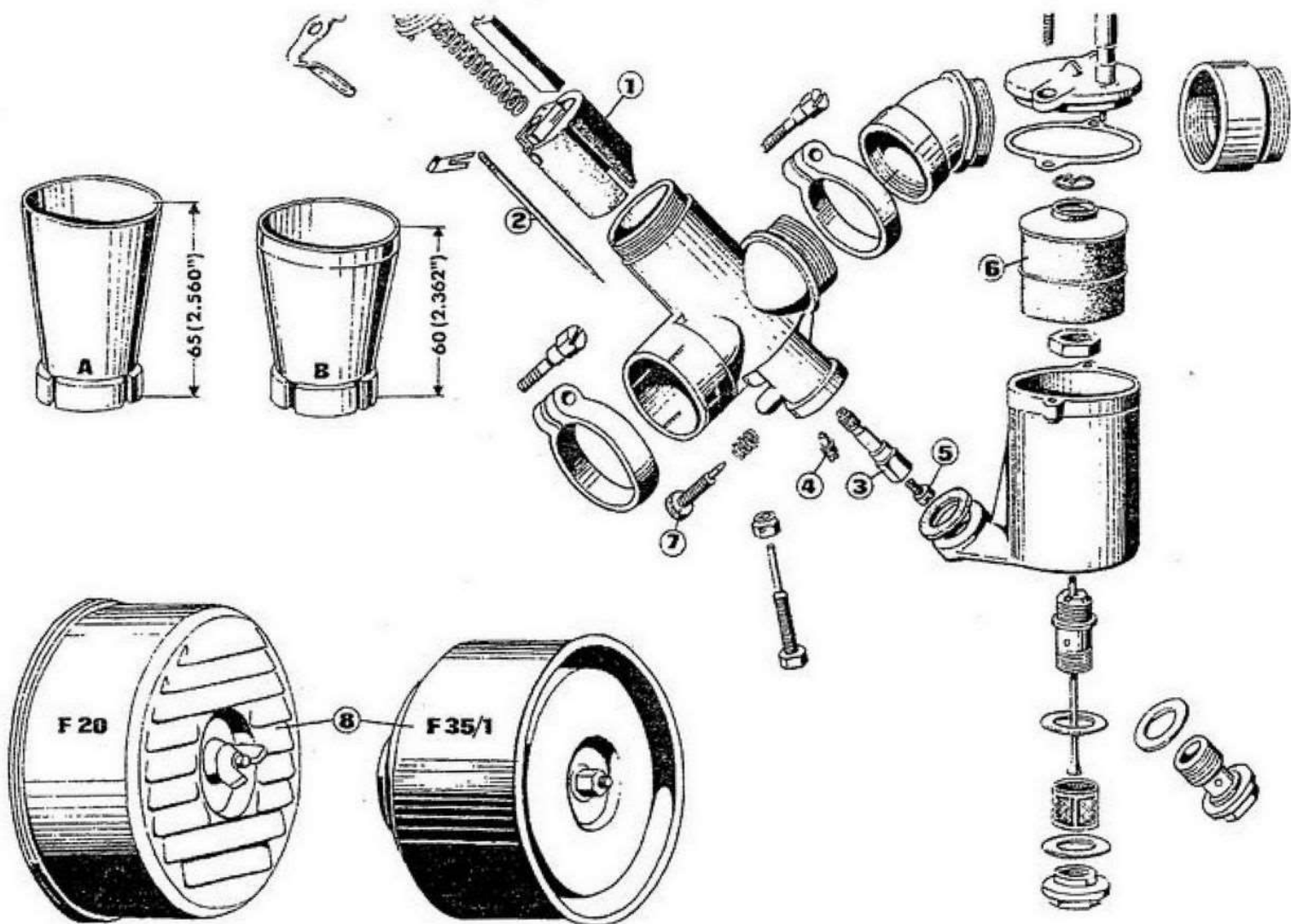


22 OIL FILTER ASSEMBLY

Thoroughly clean the inner and outer oil filters.

Insert the outer oil filter matching the two pins with the two holes located in the oil pump.

Install the inner oil filter, spring, gasket and oil plug and tighten firmly, using 27 mm wrench.



TUNING SPECIFICATION (engine 4 and 5 speed)

125cc.

200cc.

250cc.

**CARBURETOR
DELL'ORTO**

UB 22 BS

UB 22 BS

UB 24 BS 2

1) Slide	n. 60	n. 70	n. 80
2) Needle	E 10 2 Notch	E 11 2 Notch	E 11 2 Notch
3) Needle jet	260 B	260 B	260 A
4) Idle jet	40	40	45
5) Main jet	95	100	100
6) Float bowl	gr. 7,5	gr. 7,5	gr. 7,5
7) Pilot air idle screw	1½ turn open	1½ turn open	1½ turn open
8) Air cleaner	F 35/1	F 20	F 20

NOTE: With Carburetor using air horn only the main jet must be changed.

125cc. with air horn A	main jet 95
200cc. with air horn A	main jet 105
250cc. with air horn B	main jet 108

In the first step (Idle system adjustment with throttle open from 0 to 1/8 - Section A of sketch. The proper setting of the air screw is 1 turn from locked position. If in order to obtain proper running of the engine, the air screw must be set more or less than the above instructions. A larger or smaller idle jet may be required.

Bear in mind that when closing the air adjusting screw, the fuel and air mixture is richer, and leaner when it is opened.

In the second step (Throttle valve corresponding with section B of sketch - from 1/8 to 1/4 opening). After a satisfactory idle adjustment is obtained, select the proper throttle valve and proceed as follows.

- 1) Open the throttle gradually corresponding to specifications of section B of the sketch. If the engine is running normal, the cutaway of the throttle valve is correct.
- 2) If the engine gives signs of falling in R.P.M. or backfiring, it means that the fuel and air mixture is too lean and it is necessary to replace the throttle valve with a lower cutaway (lower number).
- 3) If the engine is emitting black smoke from the exhaust pipe or is running irregularly, it means that the mixture is too rich and it is necessary to replace the throttle valve with one higher cutaway (higher number).

In the 3rd step corresponding to throttle valve opening from 1/4 to 3/8 - section C of the sketch. During this adjustment, the position of the jet needle must be checked.

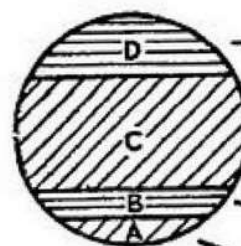
If the carburation seems to be lean, the needle position must be raised. If the carburation seems too rich, the needle position must be lowered. The needle is equipped with 5 grooves and the average position of the needle is at the third groove, beginning from the top groove. The 4th step corresponds to the throttle valve opening from 3/4 to fully open position. Section C of the sketch.

- 1) If, when running the engine, black smoke is emitted from the exhaust pipe with missing explosions and if closing the air mixture piston (choke) increases the abnormality, a smaller main jet must be installed. Repeat test until the correct size is selected.
- 2) If when running the engine at full open throttle, it will not reach the proper R.P.M. or backfiring and closing the air mixture piston (choke) the engine increases in performance, this indicates that the mixture is too lean. It is necessary to install a larger size jet. Repeat test until the correct size is selected.

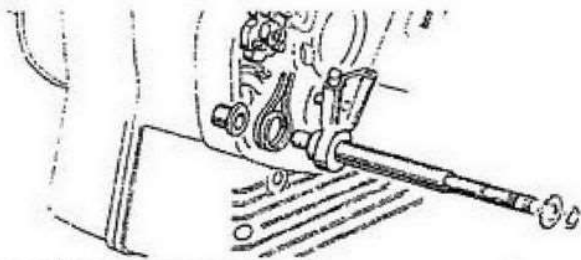
NOTE: This test must be made with the air mixture piston in open position. It is advisable to select the main jet which will give the best performance, but keeping the engine at normal temperature.

Proving diagram of the different running phases.

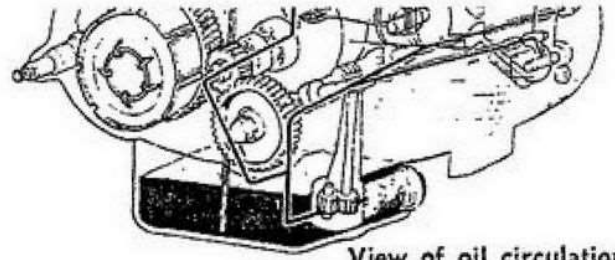
EXACT MAIN JET - normal engine temperature
 SMALL MAIN JET - higher engine temperature
 LARGE MAIN JET - lower engine temperature



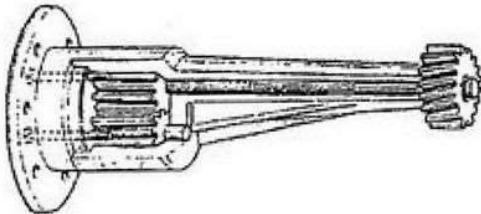
- Throttle 3/4 to fully opened
Main jet adjustment
- Throttle from 1/4 to 3/4 opened
Jet needle adjustment.
- Throttle from 1/8 to 1/4 opened
Adjustment for choosing the suitable throttle cutaway.
- Throttle from 0 to 1/8 opened
Idle system adjustment.



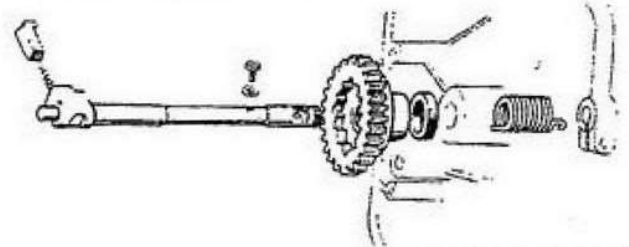
View of preselector assembly



View of oil circulation



Oil pump



View of kickstarter assembly

24 DISMANTLING AND REASSEMBLING OF VARIOUS FRAME COMPONENTS

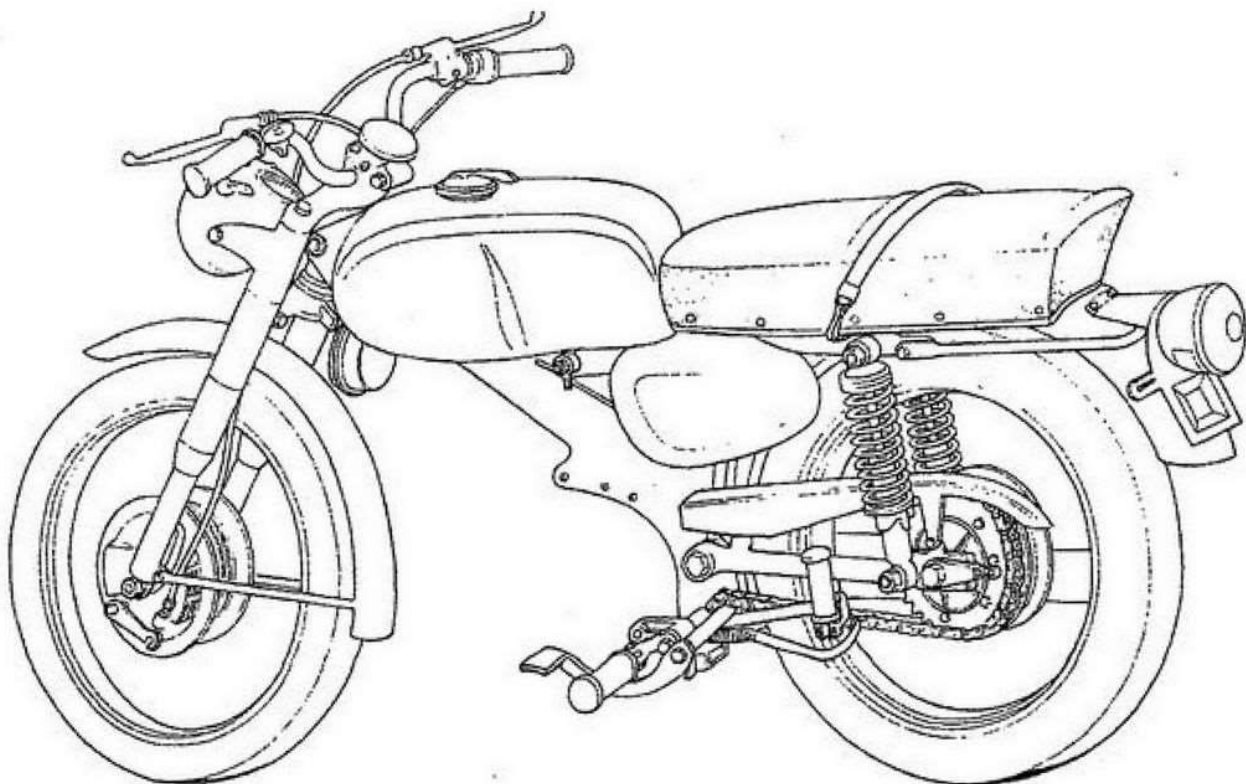
Having to disassemble the complete machine, it is advisable to dismantle the front part first.

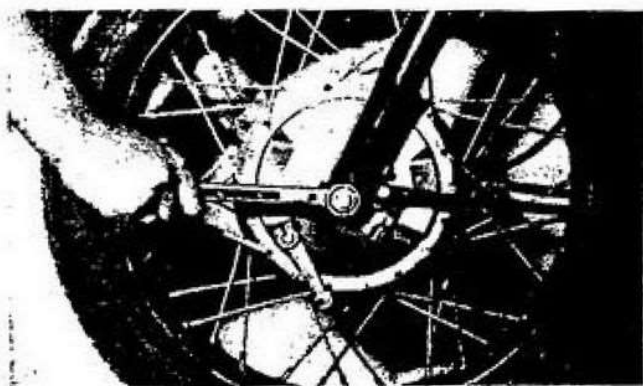
The machine can be divided in various groups depending upon the function.

FRAME - includes the skeleton of the machine, front and rear suspensions and handlebar.

Wheels and brakes, fuel tank, fenders, tool boxes and chain guard compose the BODY.

ELECTRICAL SYSTEM: Head light, tail light, battery, horn and stop light switch.





Disconnect the speedometer cable from speedometer drive and the front brake cable.

Using 22 mm wrench, remove the wheel axle nut.



Remove the axle locking with 11 mm wrench and pull out the axle and remove the wheel from the fork.



Unscrew with 10 mm wrench, the 6 fender fastening bolts and slide the fender through the top to remove it.



Remove the cotter pin from the dampener rod and unscrew the knob.



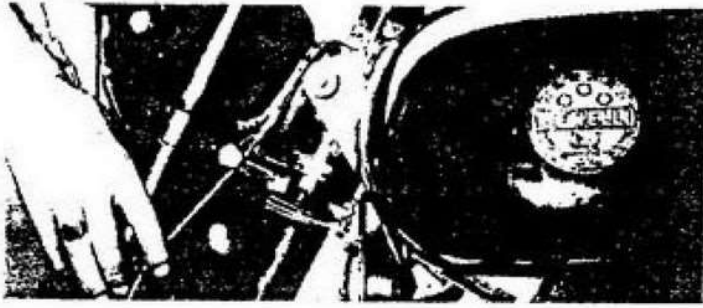
Pull out the unit from the top, being careful not to drop the lower components.



Remove the steering locking nut using 32mm wrench.



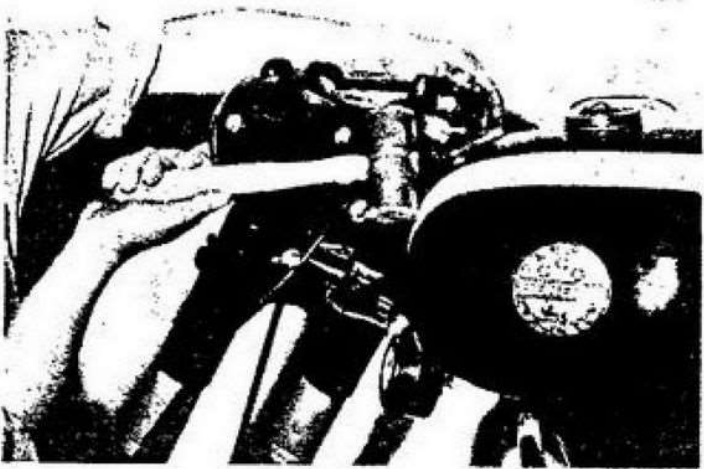
Dismantle the handlebar clamp using 10mm wrench to remove the 3 screws and remove the handlebar.



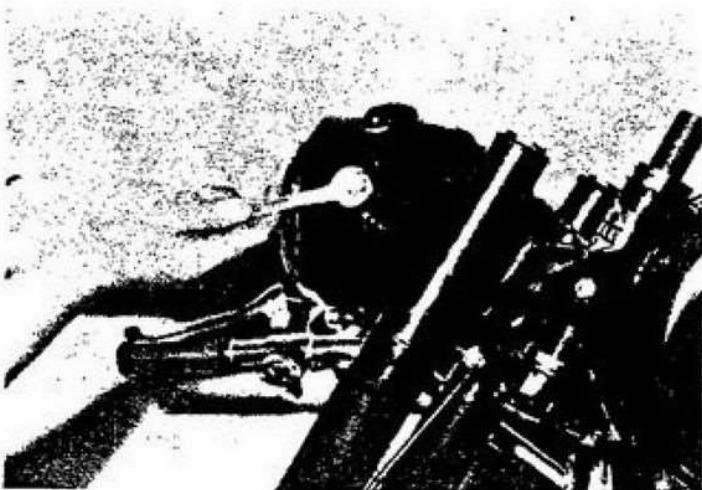
Loosen special locking bolt with 10mm wrench.



Remove the two fork tubes bolts (14mm wrench).



Remove top fork bracket.



Remove the two head light bolts with 14mm wrench.



Unscrew the threaded steering cone, using the special wrench.



Slide out the fork, from the bottom.



Pull out the front bolt to remove the fuel tank.



Disconnect the fuel lines and unlock the plate with spring, located in between the seat and the fuel tank. Then using a 14 mm. wrench remove the front bolt and the two rear bolts of the seat.



Before removing the tool boxes, it is necessary to dismantle the chain guard, in order to enable you to unscrew the lower tool box fastening bolt.



Pull out the battery



The same bolt also fastens the rear fender.

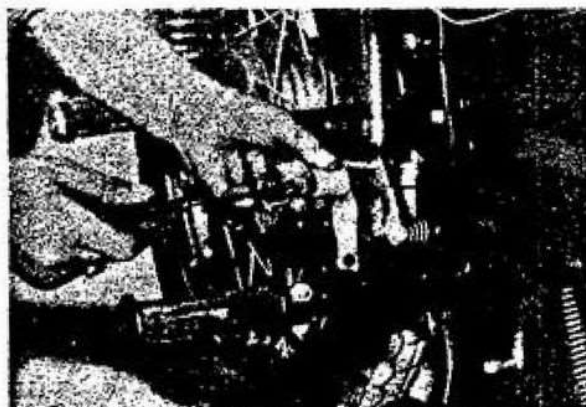


Remove the tail light wires from connector.

27 DISMANTLING THE ELECTRICAL SYSTEM



Disconnect the electrical wires from respective battery terminals.



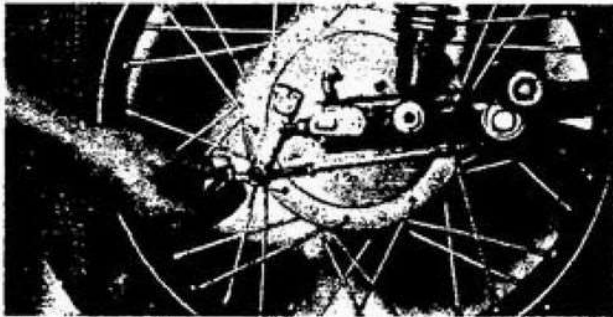
Disconnect the stop switch wires.



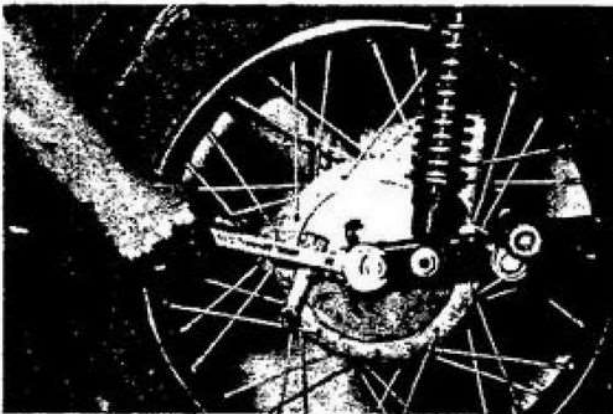
Unscrew the battery strap bolt.



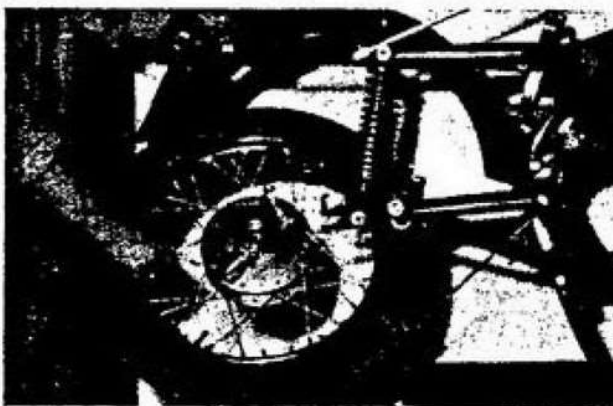
Remove the horn wires.



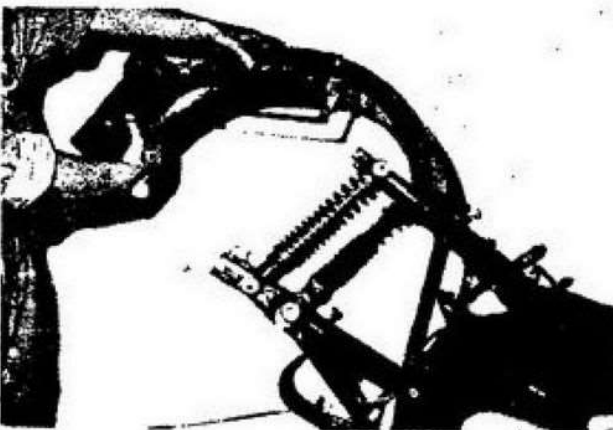
Unscrew the rear brake rod knurled nut and pull out rod from the nipple.



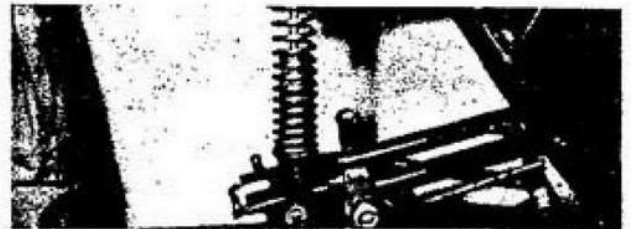
Remove master link chain and loosen the axle nuts with 22mm wrench.



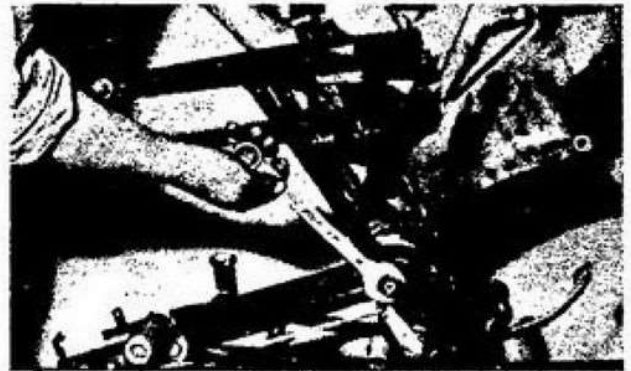
Pull out the wheel tilting the motorcycle to one side.



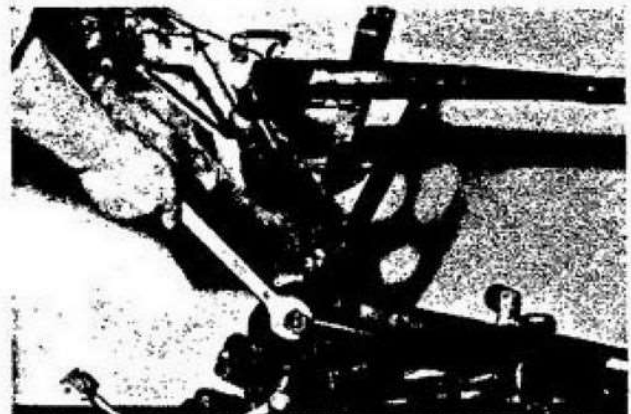
Remove the rear fender bolt and pull out fender.



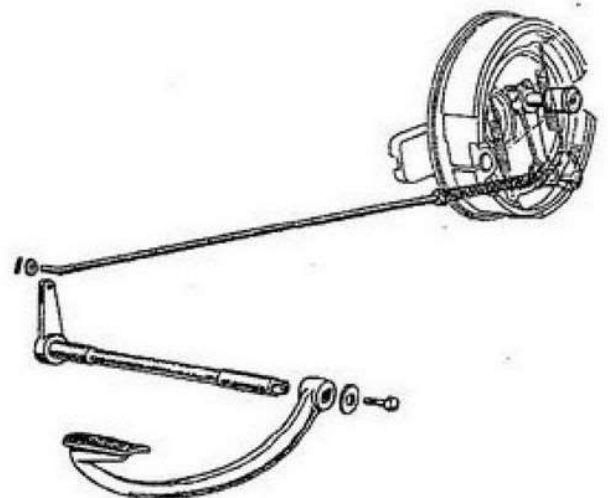
Remove the shock absorber using 14mm wrench.



Rear swing arm
Remove the nut of the swing arm shaft using 22mm wrench.

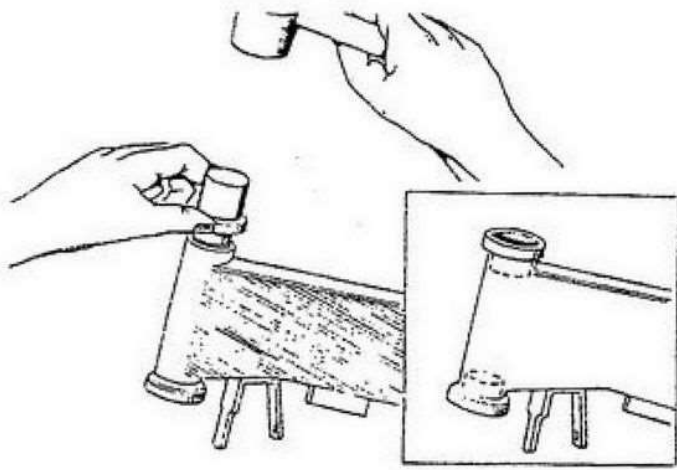


With the same wrench, unscrew the shaft.



Using 14mm wrench, unscrew the brake lever bolt. Remove the brake lever and shaft.

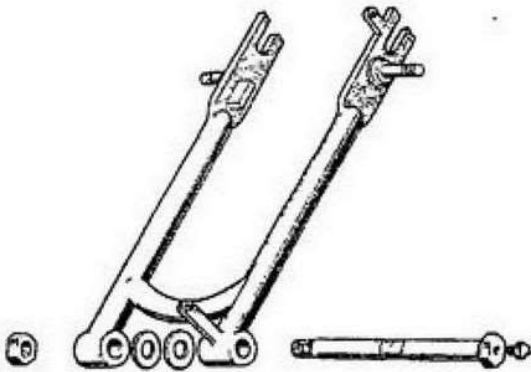
Remove the foot pegs using 17mm wrench.
Remove the stand using 19 mm. wrench.



Before proceeding with the assembly of the machine, it is necessary to prepare the various parts.

Start with pressing the two steering caps into the frame.

Install the center stand.



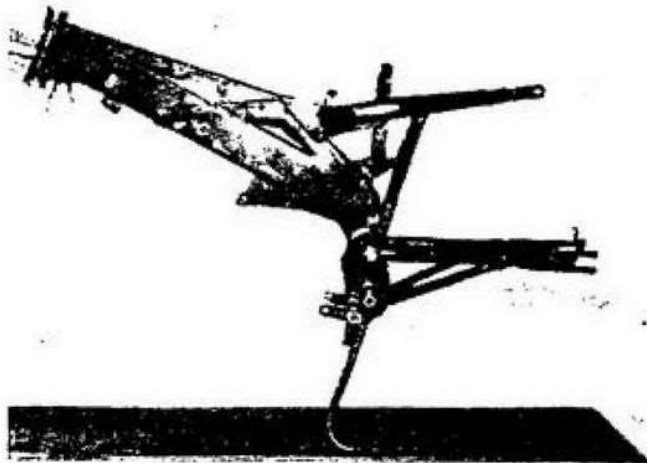
Assembly of the rear swing arm

Clean thoroughly the swing arm bushings and the passage holes of the shaft on the frame.

Control the alignment of the shaft and thoroughly clean the grease passages.

Lubricate the shaft and swing arm bushing with grease.

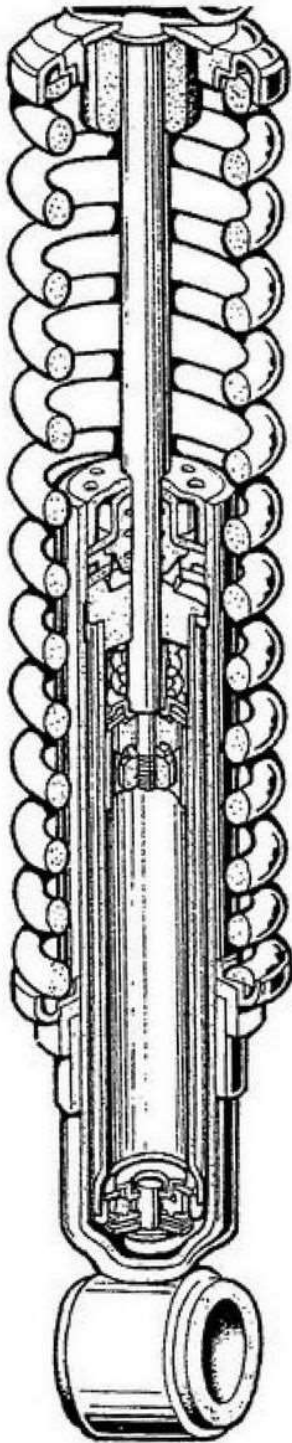
Insert the shaft after aligning the swing arm with the frame and thrust washers.



Tighten the shaft until its shoulder is touching against the swing arm. Install the locking nut on the other side and tighten at 60 ft. lb.

NOTE:

The swing arm is properly adjusted when slight friction of the swing arm against the thrust washers is obtained.

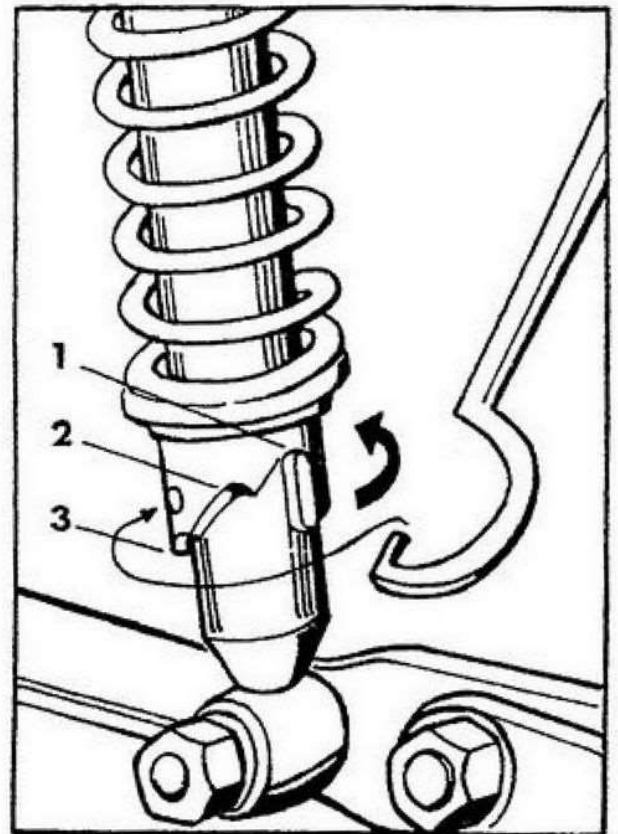


advanced type and the spring tension can be adjusted, turning the lower ring with the special tool.

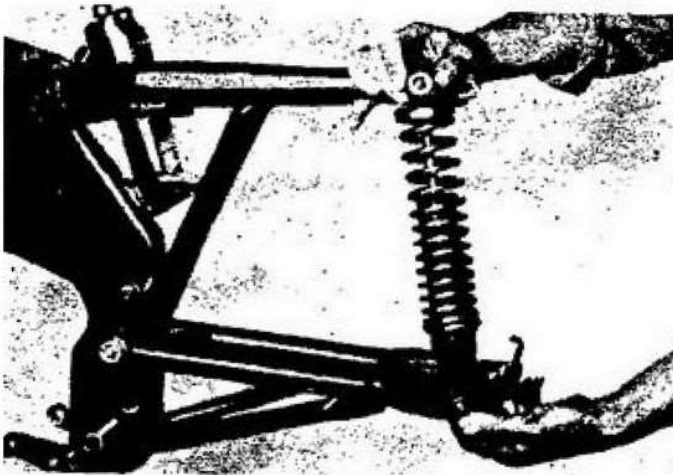
Use SAE 20 oil.

G. 65 (oz. 2,3) for each shock absorber.
3 way - Adjustable shock absorber.

Technical data

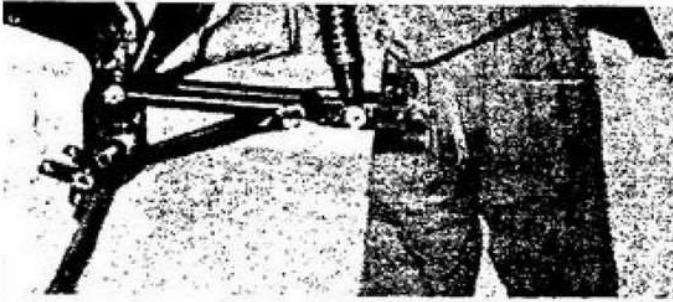


- 1 = Kg. 14 (lb. 31)
- 2 = Kg. 34 (lb. 75)
- 3 = Kg. 54 (lb. 119)

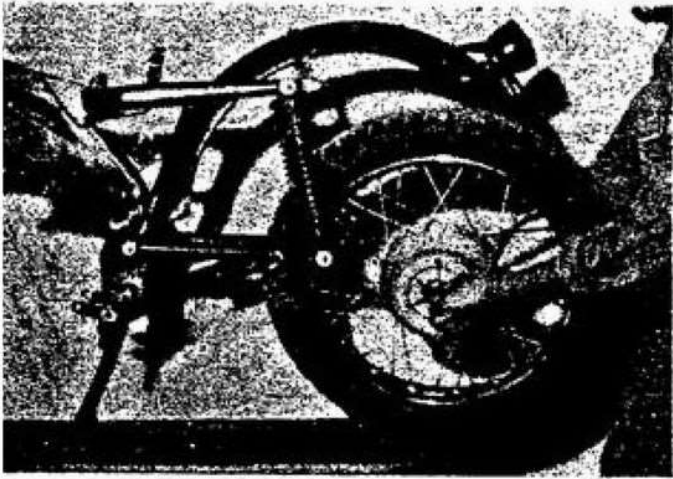


Insert the two half rubber rings and steel bushings at each opening of the shock absorber and slide it on the respective shafts.

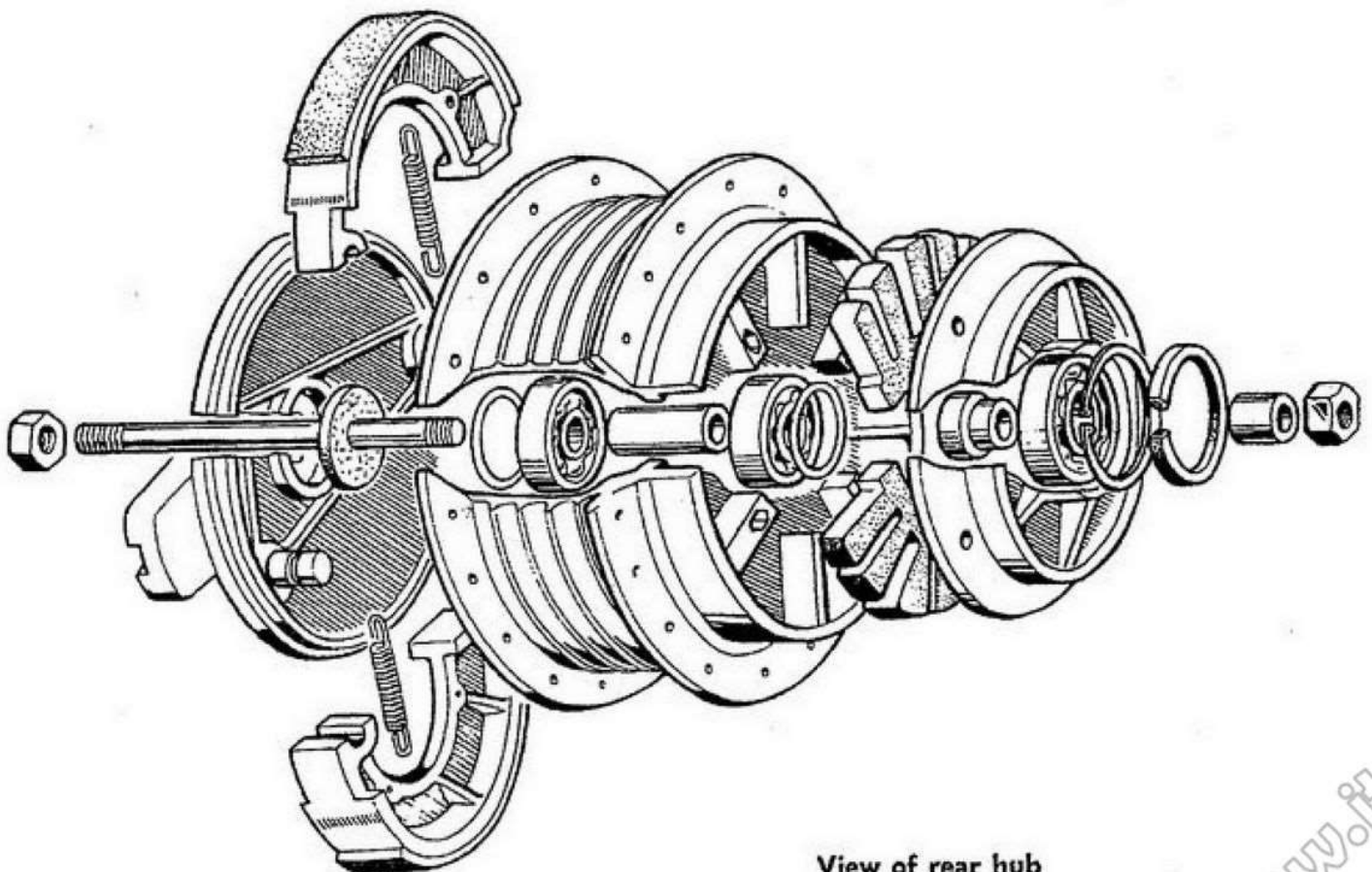
Tighten at 25 ft. lb., using 17mm wrench.



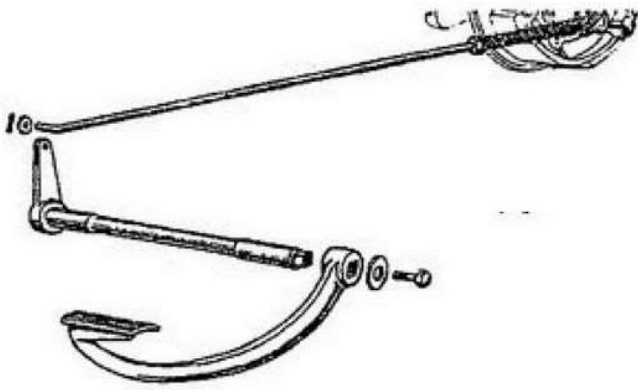
Insert in position the rear fender and fasten it with bolts as shown in the figure alongside.



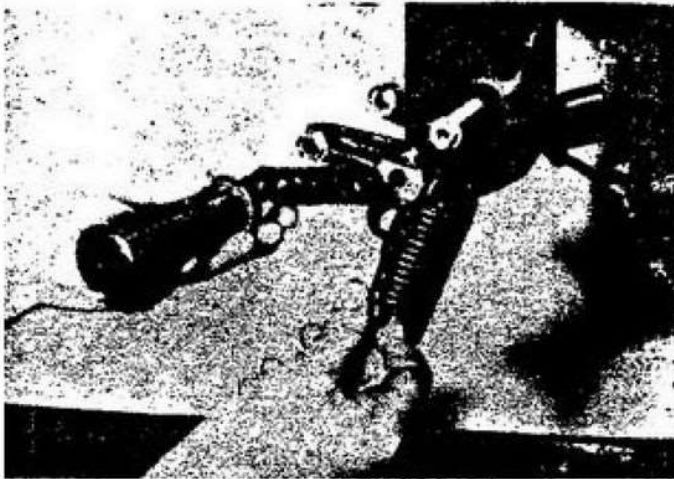
Install the rear wheel as shown in the figure.
NOTE: The anchor slot of the brake plate must be matched with the plate which protrudes from the right hand side of the swing arm.



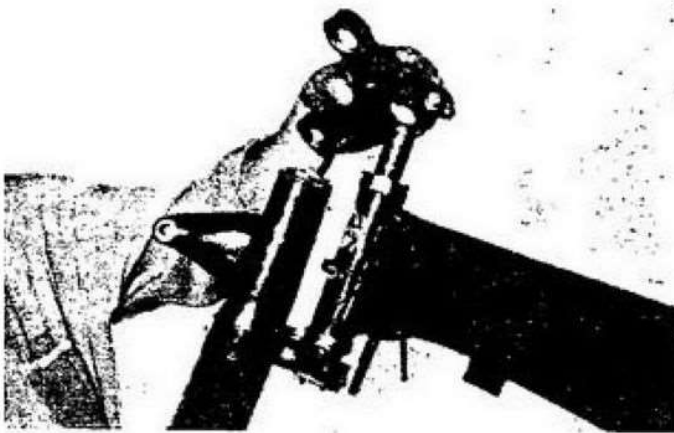
View of rear hub



After the rear wheel has been installed, assemble the brake lever unit in sequence, as shown in figure alongside.



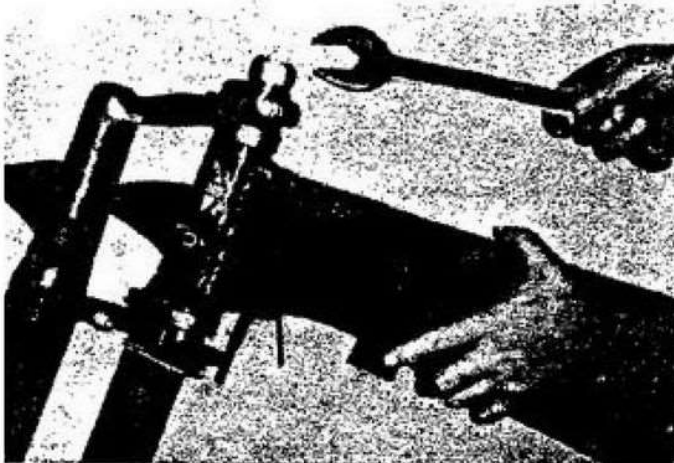
Install foot peg.



31 ASSEMBLY OF THE FRONT FORK

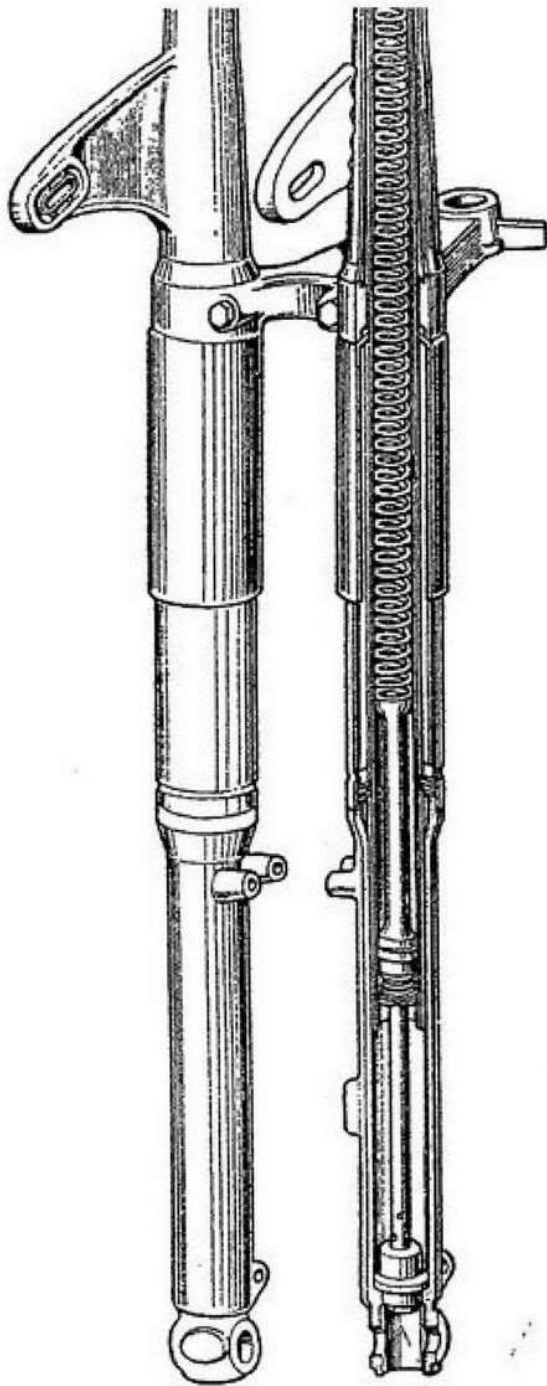
Install the 24,3/16 ball bearings with heavy grease on each steering cap. Slide the fork in position and screw on the threaded steering cone.

Assemble the top fork brocket and the two fork tubes bolts.



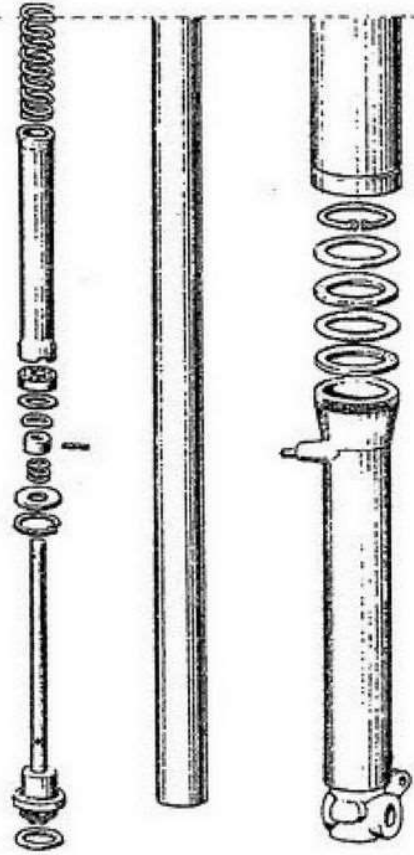
Install and lock the steering nut. Tighten special pinching bolt.

Adjust the steering mechanism by tightening the threaded steering cone until the steering is free, but without play.



hydraulic shock absorber.

To drain oil from telescopic tube, remove the 5mm screw with screw driver located at the bottom of the wheel support tube. Refill with SAE 20 oil from the top, after the bolt has been removed.



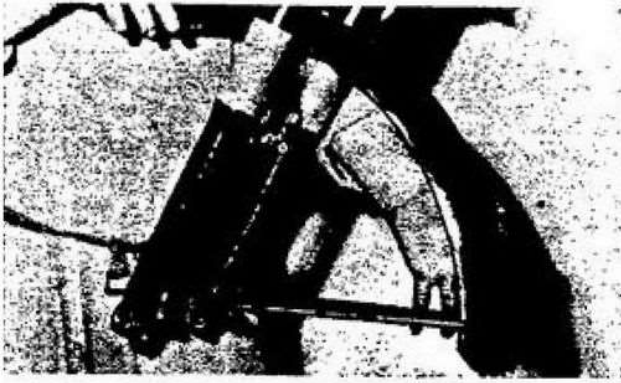
IMPORTANT NOTE

To remove the hydraulic tube

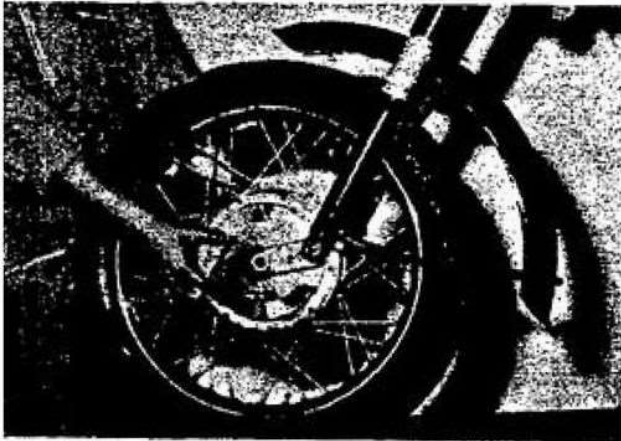
Turn clockwise the plug (key n° 14 mm.) to reassemble, reverse the operation.

To remove fork tube from fork

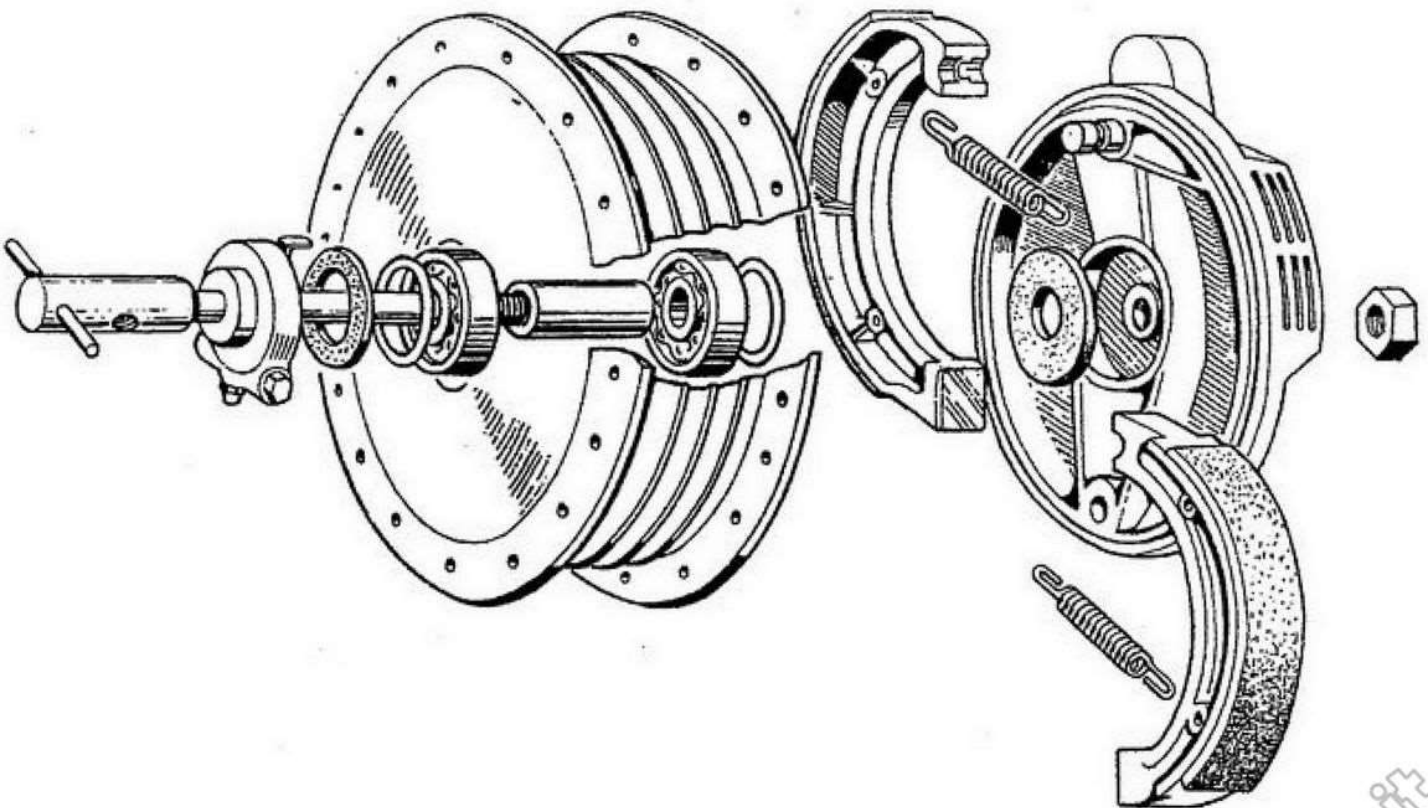
Dismantle the top bracket bolt. Loosen the lower bracket bolt then pull tube out from the bottom.



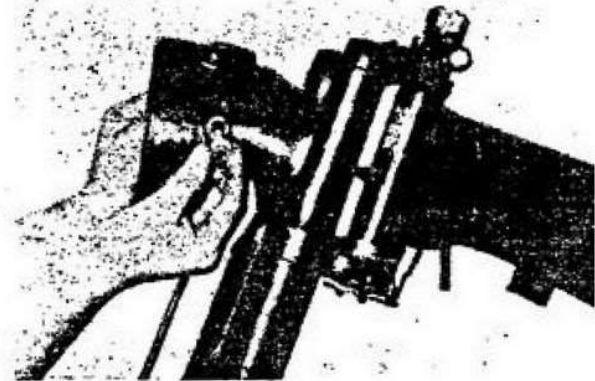
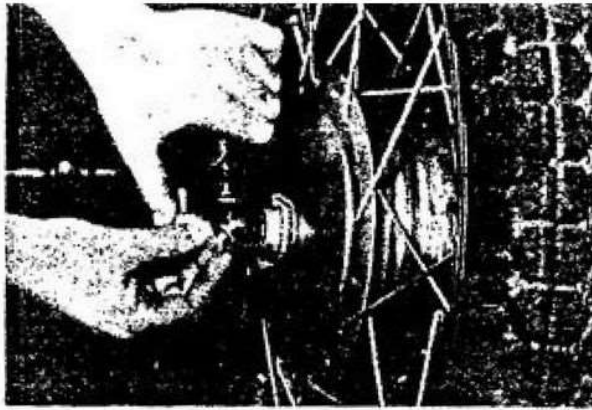
Install the front fender, locking the bolts with 10mm wrench.



Insert the front wheel being careful to match the slot of the anchor plate with the protruding plate of the wheel support.



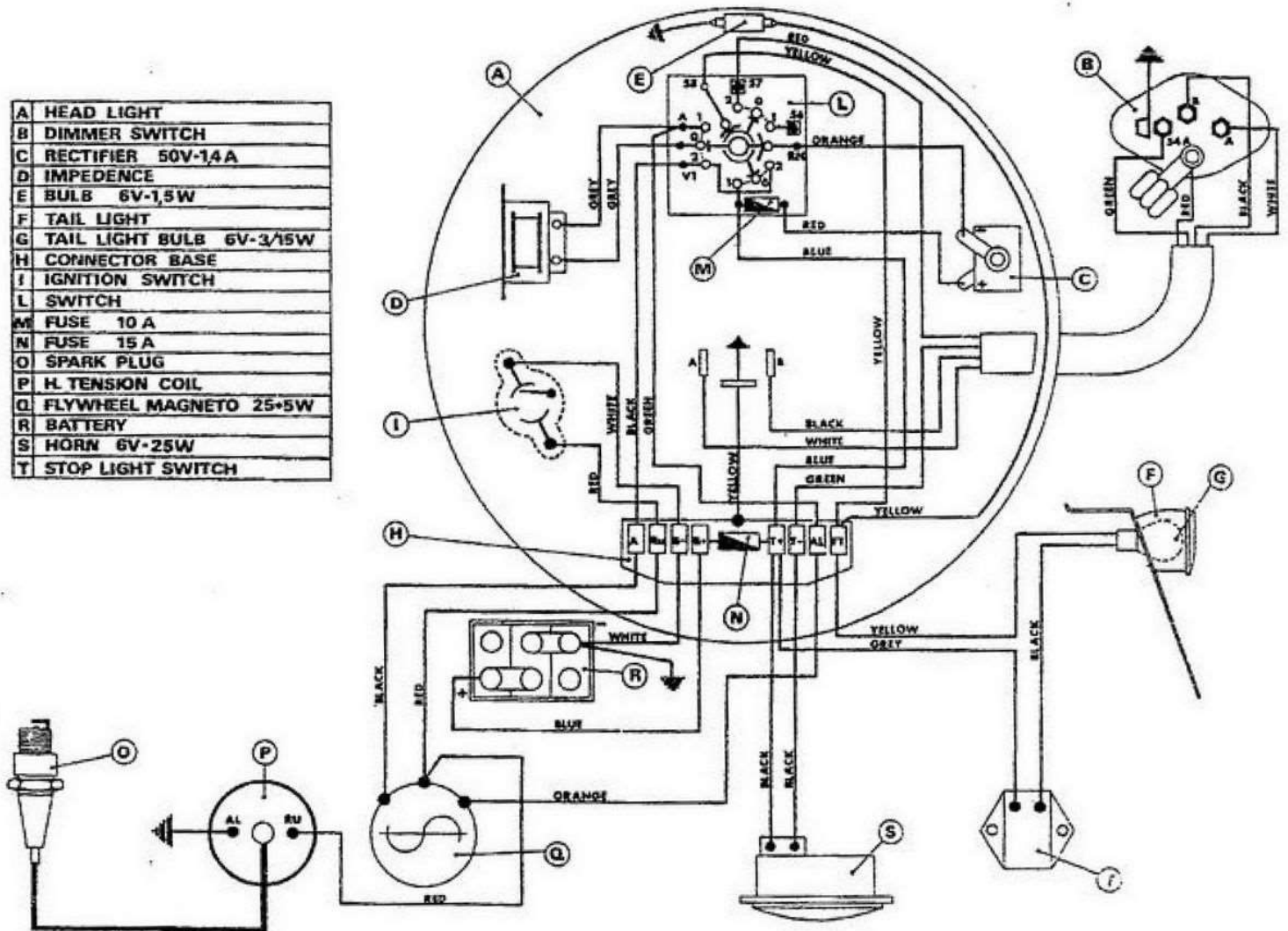
View of front hub



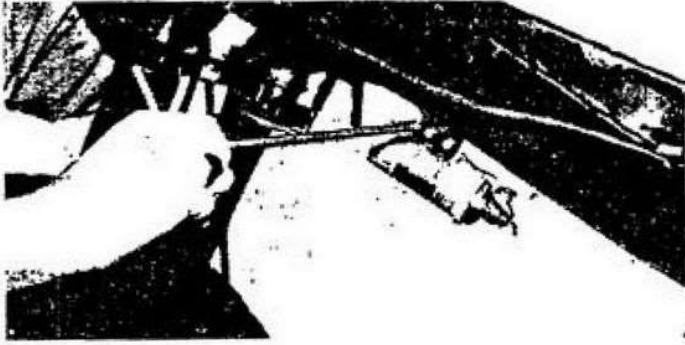
NOTE: After the installation of the front wheel, shake it vigorously up and down before tightening the axle locking bolt.

Install the head light.

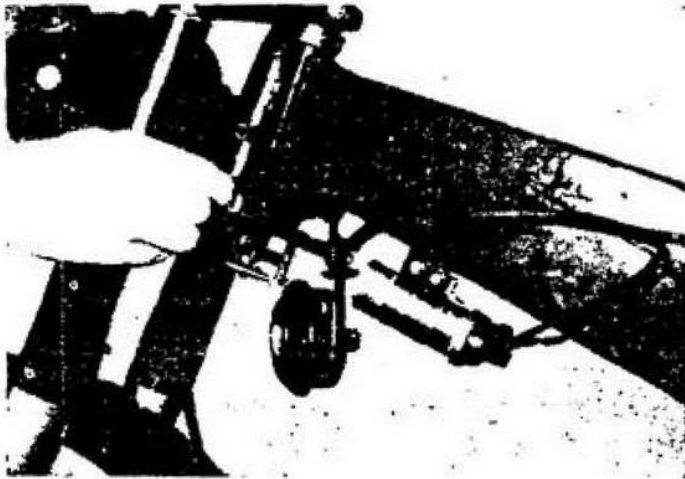
A	HEAD LIGHT
B	DIMMER SWITCH
C	RECTIFIER 50V-1.4A
D	IMPEDENCE
E	BULB 6V-1.5W
F	TAIL LIGHT
G	TAIL LIGHT BULB 6V-3/15W
H	CONNECTOR BASE
I	IGNITION SWITCH
L	SWITCH
M	FUSE 10 A
N	FUSE 15 A
O	SPARK PLUG
P	H. TENSION COIL
Q	FLYWHEEL MAGNETO 25*5W
R	BATTERY
S	HORN 6V-25W
T	STOP LIGHT SWITCH



33 WIRING DIAGRAM. FOR 3 WIRE FLYWHEEL MAGNETO.



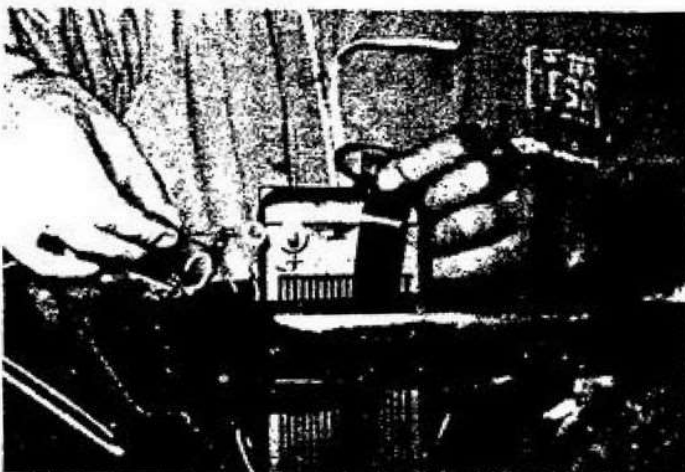
Installation of high tension coil.
Lock the two bolts firmly.



Install horn using 14mm wrench to lock
the bolt.

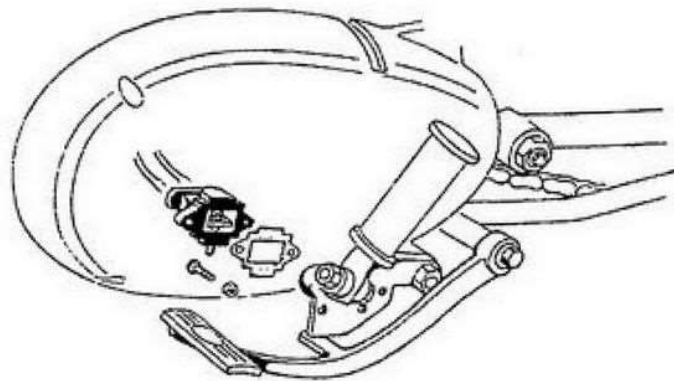
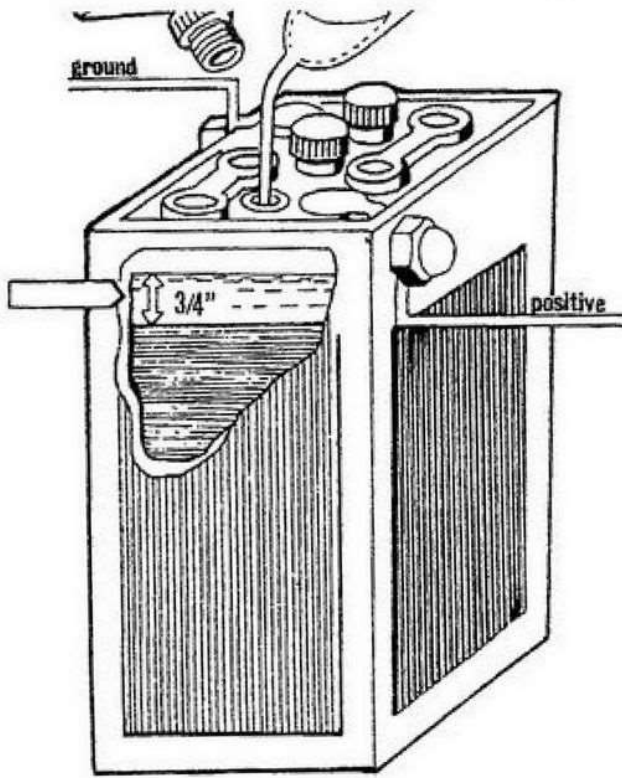


Hold the wiring harness in position, using
the special steel strap.



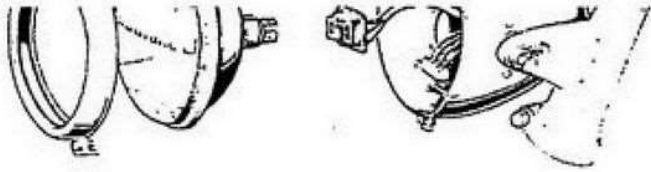
34 BATTERY

Insert battery and attach the wire
as on pg. 62



- B. Disconnect battery, remove the lid and disconnect wires.
- C. Specifications: make safe 3 V 2 capacity 8 AH.
- D. Note position of battery and cables before removing. Remove battery from the machine. Make sure that cables (wires) are not reversed when replacing the battery.
- E. Unscrew caps.
- F. Fill with pure sulphuric acid used for storage battery, having a specific gravity of 1275 at 60 degrees F. This operation is very important and, therefore, it is recommended that the specific weight be checked very carefully. Fill battery to approximately 3/4" above plates.
- G. Let the battery rest for about two hours, then bring back to the required level by adding as much sulphuric acid as necessary. Then charge at 3/4 amp rate for eight to ten hours.
- H. Once all the above operations have been completed, the battery is ready to be placed in position. Every month, check the battery level which should always be about 3/4 of an inch above plate.
- I. **Important:** only add chemically pure distilled water and not sulphuric acid to bring level back to the required position.
- J. Mount battery and lock container.

Install the stop light switch and attach the spring to the brake lever. Be careful that the stop light switch is not touching the rear wheel tire. Attach the tail light wire as shown in the figure along side.

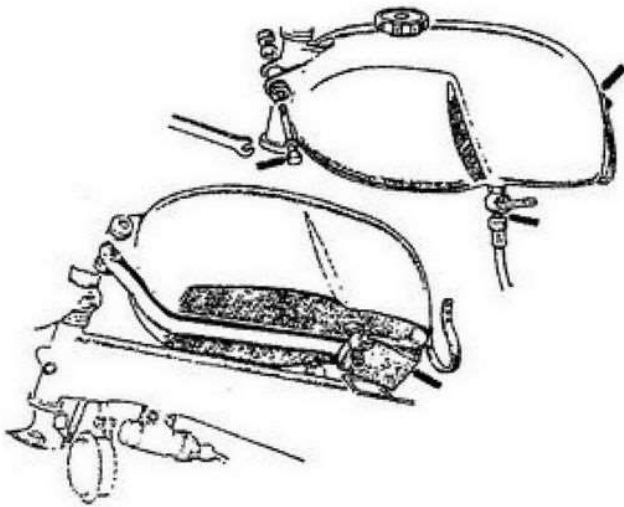


Install the reflector unit, locking the screw firmly.

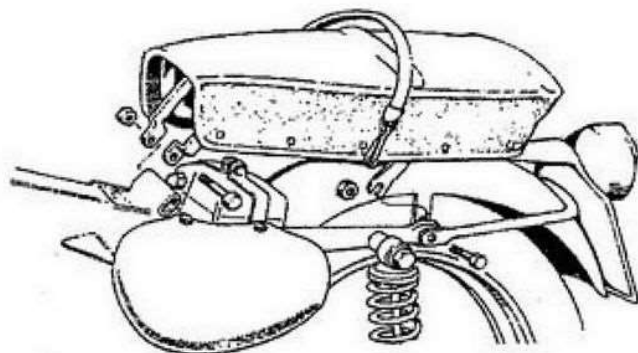


36 HANDLEBAR ASSEMBLY

Lay the handlebar on the top fork bracket. Insert the bracket and tighten the 3 bolts firmly, after the desired position of handlebar is set.

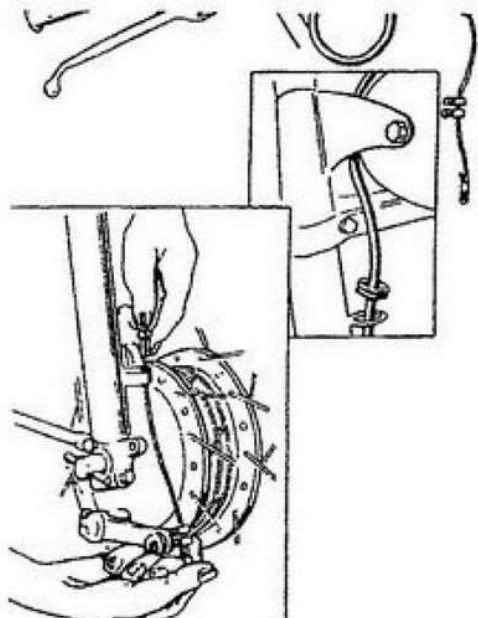


Install the dimmer switch.



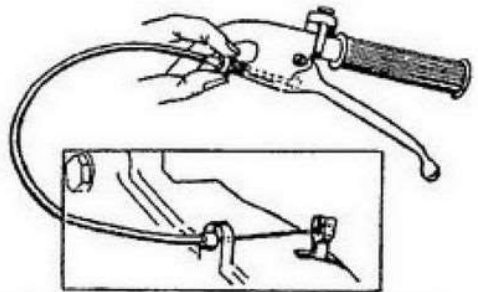
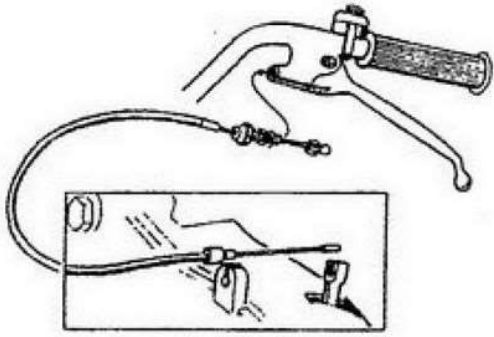
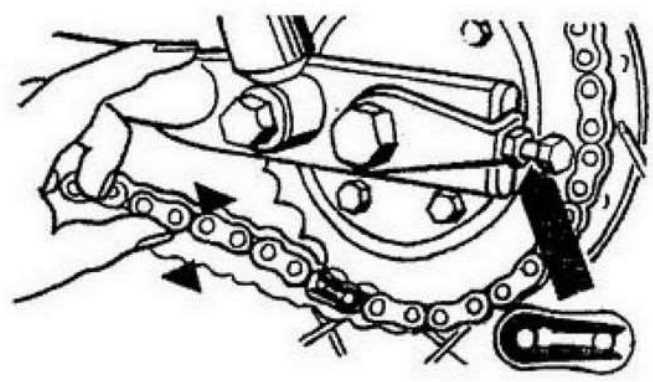
Install the felt under fuel tank and slide the tank as shown in the picture alongside. Install the front bolts and attach the hook to the tank.

Install the seat and front bolt. Align the slots of the two rear seat brackets with the rear fender bolts. Press the seat down and lock firmly with 14mm wrench.

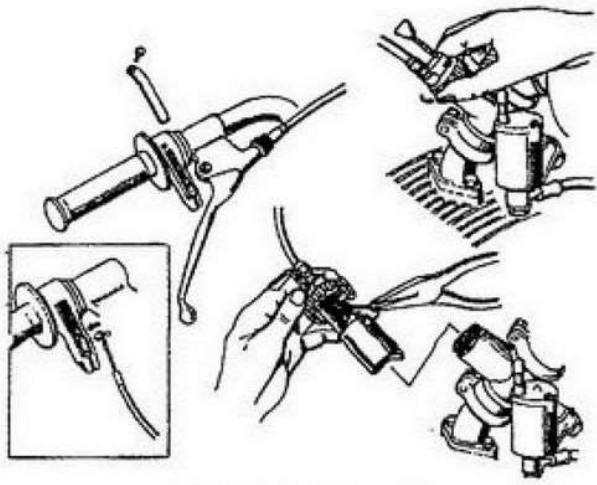


Attach front brake cable

of the rear wheel chain, proceed as follow. Remove the motorcycle from the stand. Sit on bike and adjust the chain until this has at least 5/16" to 1/2" slack, moving the wheel backward of forward turning the chain tension nuts. After this operation check alignment of wheels.



Attach the throttle, clutch and brake cable



Attach throttle cable.

