

HESKETH
WORKSHOP MANUAL

Model V1000

Model VAMPIRE

1983 onwards

EN10 Engine modifications are covered in
"The EN10 Story"

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HESKETH MOTOR CYCLES

1000cc v-Twin 1981

Fault Diagnosis : Charging System

TEST EQUIPMENT REQUIRED

0-20V.DC Voltmeter 0-5000 rpm Tachometer

0-50V.AC Voltmeter 0-1000 Ohmmeter

or Souriau 1520-02 Motor tester

Test 1

Battery condition checks with 0-20V. DC Voltmeter.

A. Remove L.H. side panel. Fold back battery positive terminal rubber cover connect negative voltmeter lead to battery negative terminal. Connect positive voltmeter lead to battery positive terminal.

1. Switch ignition **OFF**.

Battery voltage should be minimum 12.3 volts.

2. Switch ignition on (ensure lights, etc., are off)

Battery voltage should be minimum 11.5 volts.

3. Switch ignition **ON** engage electric starter for five seconds.

Batter voltage (continuous operation) should be minimum 9.5 volts.

If the above results are not attained check battery electrolyte level, terminal condition or replace.

If battery is OK charging system should then be checked.

TEST (2) Charging System Checks

With voltmeter connected as in test (1) proceed with the following tests:-

A. Start engine and run at 2000 rpm. Lights etc., off

Voltage indicated should be :- minimum 12.8 volts maximum 14.8 volts

B. If below 12.8 volts, proceed as follows:- Alternator test (no load).

Equipment required :- 0-50V. AC Voltmeter or Souriau 1520.

Locate the three alternator output leads to the rectifier, disconnect the leads.

Connect one AC Voltmeter lead to one of the alternator leads, connect the other voltmeter to one of the other alternator leads, run engine at 1500 rpm lights OFF. AC voltage should be a minimum 25 volts.

Repeat test between second and third alternator leads. Repeat test between third and first alternator leads.

Voltage readings must be identical in each test., if not replace alternator after checking that alternator leads are not damaged.

C. If below 12.8 volts and alternator test (no load) is good, check rectifier as follows:-

Equipment required: 0-10000 Ohmmeter (Souriau 1520)

To Disconnect Rectifier:-

Locate rectifier positive, negative and 3 alternator input leads, connect one ohmmeter lead to rectifier earth lead. Connect other ohmmeter lead to each alternator lead in turn; note reading. Reverse ohmmeter leads

and repeat test. In one test, readings should be zero. In repeat test, readings should show resistance readings of equal value. Remove ohmmeter lead to rectifier negative and connect to rectifier positive lead.

Repeat tests as above and note readings as before. If readings in all tests are not as stated replace rectifier.

D. Reconnect rectifier, alternator leads etc.,

HESKETH MOTORCYCLES

1000 V-Twin 1981 CHARGING SYSTEM

- Alternator input to rectifier

- Rectifier negative (earth lead)

+ Rectifier positive (battery/fuse) lead

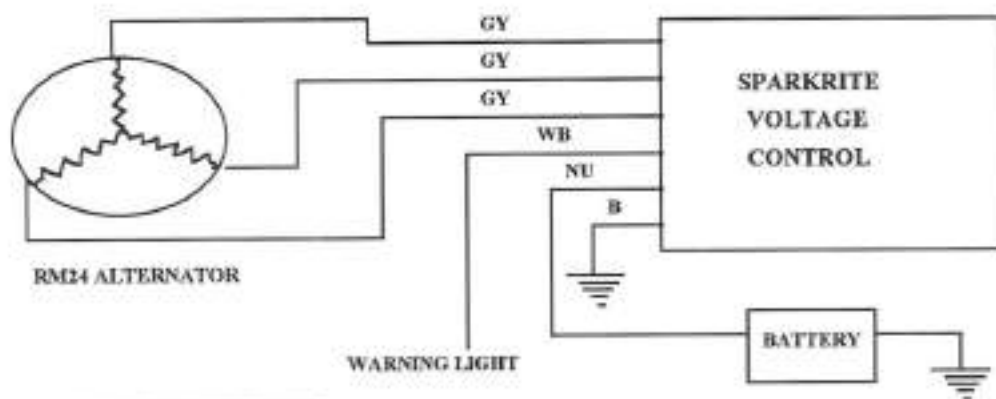
(diagram)

Run engine to 2000 rpm. Switch lights **ON**, voltage indicated should be : minimum 12.5 volts

maximum 14.8 volts

If below 12.6 volts, check all wiring connections and switches.

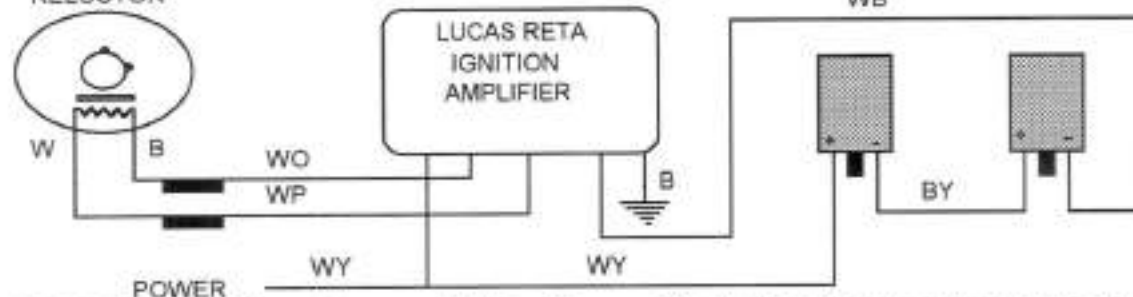
HESKETH MOTORCYCLES 1000 V-Twin 1981 CHARGING SYSTEM



CABLE COLOURS
 GY = GREEN/YELLOW
 WB = WHITE/BLACK
 NU = BROWN/BLUE
 B = BLACK

NOTE - CHECK WATER SEAL ON SPARKRITE BOX AND ENSURE BY THE USE OF SELANT THAT NO WATER HAS OR CAN ENTER

HESKETH MOTORCYCLES 1000CC V.Twin 1981 IGNITION SYSTEM



NOTE :-Do not turn the engine over with the ignition on without earthing the H.T. leads, otherwise damage to the ignition will occur.

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IGNITION TEST SEQUENCE FOR NO SPARKS AT PLUGS

Test 1

Test point A in diagram, 0-1000 V, AC meter.

At cranking speed for 5 seconds (plugs out of cylinders) ignition on : Results : 200-400 volts AC System Good.

Test 2

1. Test point A on lower coil 0-20V DC Meter

Switch Ignition on only 2-6 volts DC. coil good

2. Test point A on upper coil 0-20V DC Meter

Switch ignition on only. 8-12 volts DC. coil good

Test 3

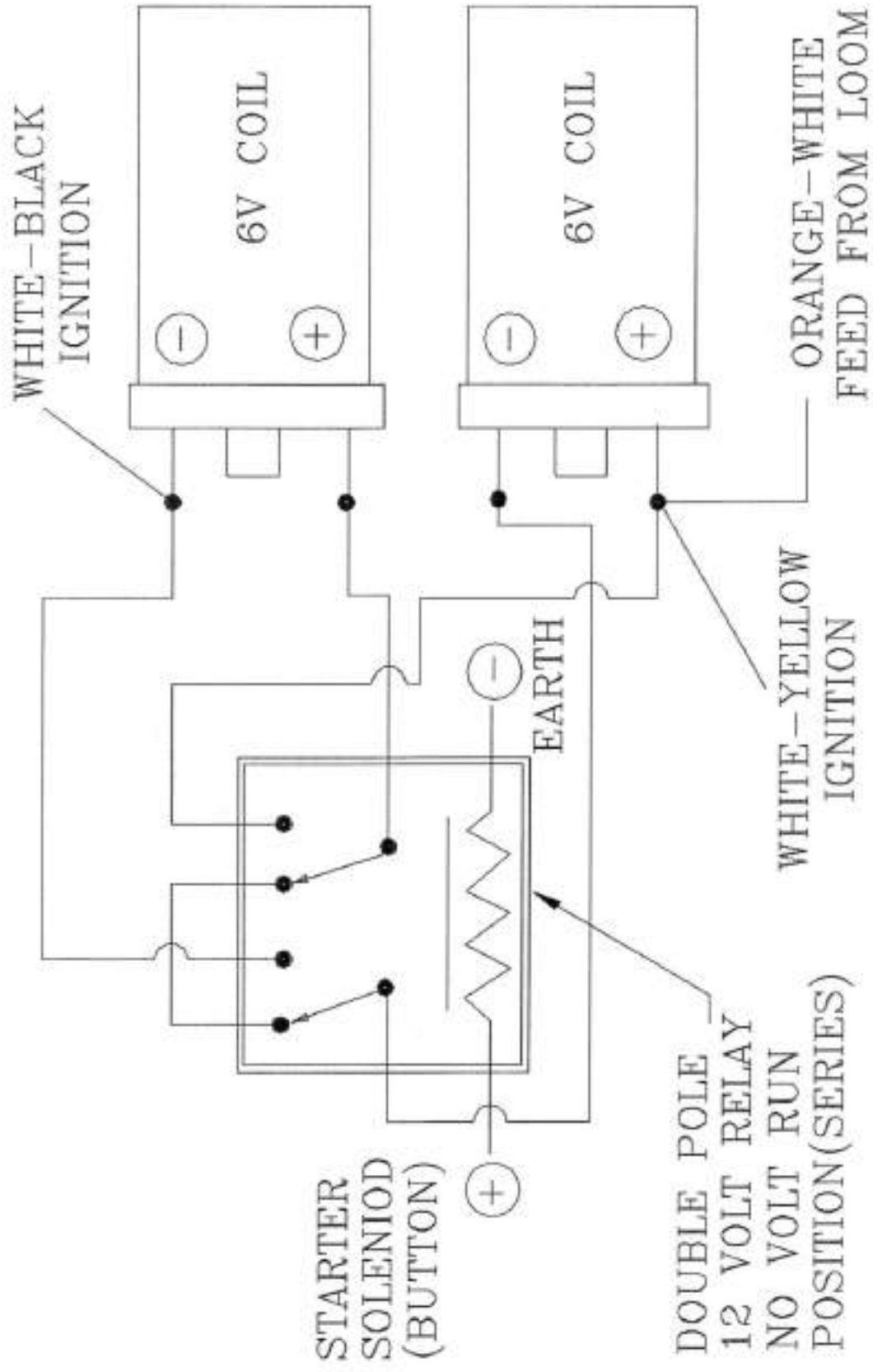
Test point C between white and black leads from pulser unit on rear camshaft.

0-50V, AC Meter.

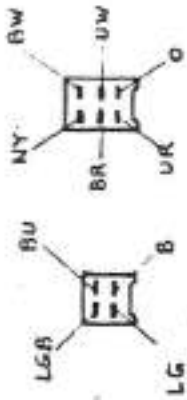
At cranking speed for 5 seconds (plugs out of cylinders) Ignition, on. Results 10-30 volts AC pulser unit good, pulser supply circuit (in ignition unit) good.

Diagnosis of Test Results

1. If test (1) is OK but no spark H.T. Coil secondary circuit U/S, check secondary coil resistance and plug leads/caps.
2. If test (1) is "bad" but tests (2), (3) are OK, control unit is U/S or ignition coils u/s: primary resistance bad - check coil resistance.
3. If test (1) and (2) are "bad" but test (3) is OK, H.T. coil primary u/s or + feed to control unit or coils u/s (ignition switch), check coil primary resistance first.

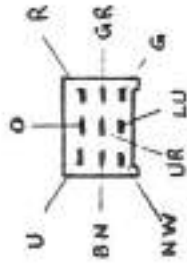


BROOM DEVELOPMENT ENGINEERING - DEC 88
 MODIFICATION TO RETA IGNITION SYSTEM
 HESKETH V1000 AND VAMPIRE ENGINES - STATUS OPTIONAL



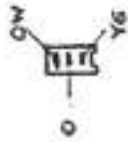
D. E.

SELF CANCELLING UNIT



G.

INSTRUMENT HOUSING



F.

CUTOUT AND STARTER SWITCHES
(GREEN MOULDING)

| CUTOUT SWITCH | | STARTER SWITCH | |
|---------------|-----------------------------|----------------|--|
| OFF | IGNITION ORANGE WHITE | OFF | IGNITION ORANGE WHITE STARTER YELLOW GREEN. |
| RUN | IGNITION ORANGE WHITE | ON | IGNITION ORANGE WHITE STARTER YELLOW GREEN. |

COLOUR CODE.

- W WHITE
- Y YELLOW
- G GREEN
- R RED
- O ORANGE
- B BLACK
- S SLATE
- P PURPLE
- U BLUE
- N BROWN
- LG LIGHT GREEN
- LU LIGHT BLUE.
- K PINK

| FUNCTION | HOUSING WIRE COLOURS | HARNES WIRE COLOURS |
|-----------------|----------------------|---------------------|
| OIL W.L. | RED | GREEN PURPLE |
| NEUTRAL W.L. | GREEN RED | GREEN BLACK |
| EARTH | GREEN | BLACK |
| TURN LIGHT W.L. | LIGHT BLUE | GREEN WHITE |
| CHARGE W.L. | BLUE RED | WHITE BROWN |
| ALUMINIUM | BROWN WHITE | BROWN GREEN |
| SUPPLY | BLACK BROWN | ORANGE WHITE |
| MAIN BEAM W.L. | BLUE | YELLOW WHITE |
| TURN LEFT W.L. | ORANGE | GREEN RED |

HESKETH V1000
1982 ONWARDS

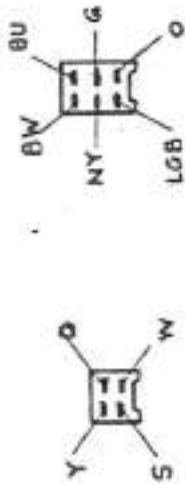


A.

IGNITION SWITCH

(GREEN MOULDING)

| | BATTERY, RED | LIGHT SWITCH, ORANGE | PILOT, TAIL, BROWN | HORN SWITCH, GREY | |
|--------|--------------------------|--------------------------|--------------------------|--------------------------|------|
| LOCK | | | | | LOCK |
| OFF | | | | | OPEN |
| ON | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | OPEN |
| PILOT. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | LOCK |



B.

LIGHTS, DIP, DIRECTION INDICATORS

PASS AND HORN SWITCH. (LH M'BAR)

LIGHTS.

| | IGNITION SWITCH, ORANGE | SLATE | DIP SWITCH, YELLOW | PASS SWITCH, LW | DIP BEAM, WHITE | |
|-----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|
| OFF | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| ON | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

PASS.

| | LIGHT SWITCH, LW | MAIN BEAM, YELLOW | |
|-----|--------------------------|--------------------------|--|
| OFF | <input type="checkbox"/> | <input type="checkbox"/> | |
| ON | <input type="checkbox"/> | <input type="checkbox"/> | |

DIP

| | LIGHT SWITCH, YELLOW | DIP, WHITE | MAIN, YELLOW | |
|------|--------------------------|--------------------------|--------------------------|--|
| HIGH | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| LOW | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

HORN

| | EARTH, BLACK | HORN, GREEN | |
|-----|--------------------------|--------------------------|--|
| OFF | <input type="checkbox"/> | <input type="checkbox"/> | |
| ON | <input type="checkbox"/> | <input type="checkbox"/> | |

C.

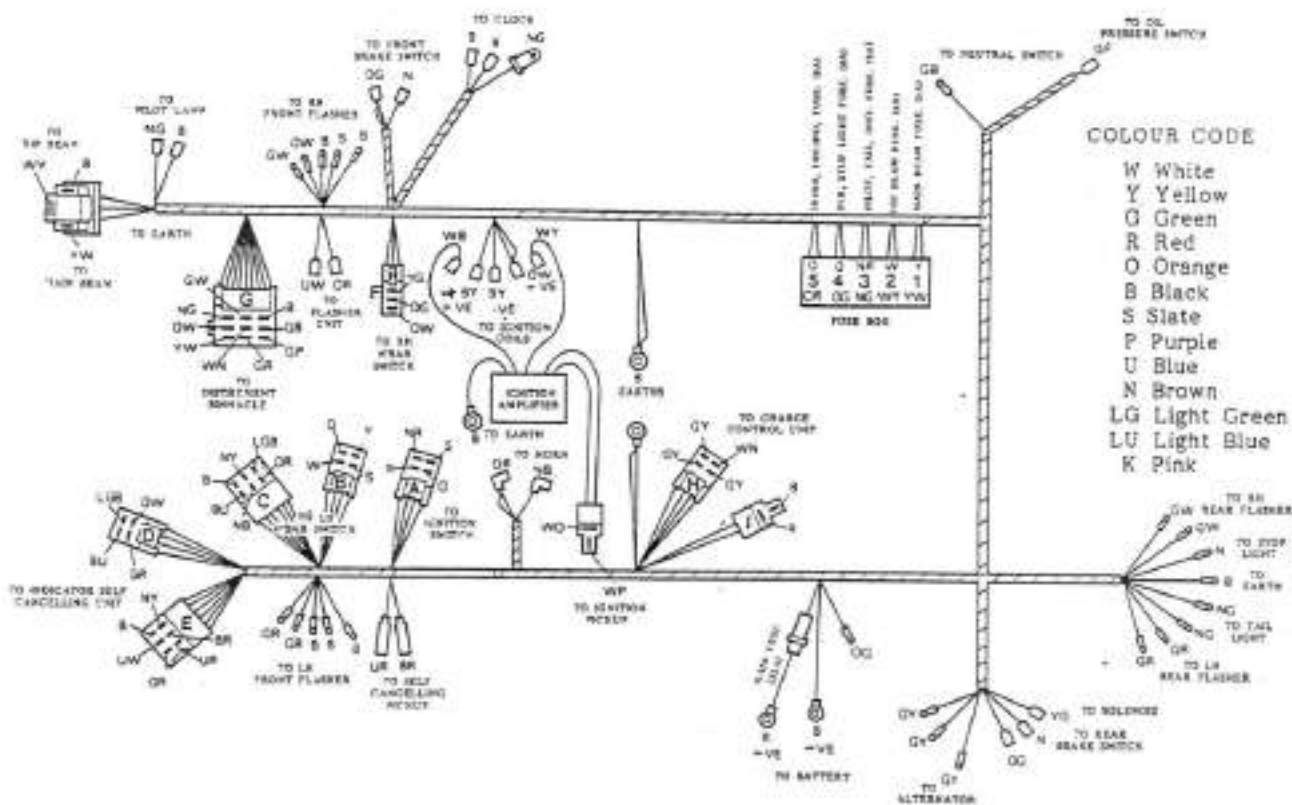
TURN SIGNAL

| | LEFT LAMPS, BLACK | FUSE BOX, ORANGE | RIGHT LAMPS, LIGHT GREEN | |
|-----|--------------------------|--------------------------|--------------------------|--|
| R | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| OFF | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| L | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |

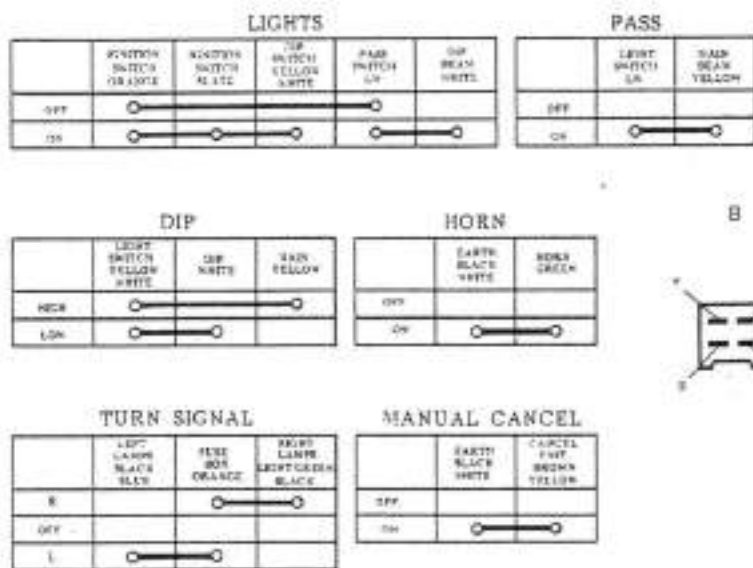
MANUAL CANCEL

| | EARTH, BLACK | CANCEL UNIT, BROWN | |
|-----|--------------------------|--------------------------|--|
| OFF | <input type="checkbox"/> | <input type="checkbox"/> | |
| ON | <input type="checkbox"/> | <input type="checkbox"/> | |

WIRING DIAGRAM.



LIGHTS, DIP, DIRECTION INDICATORS
PASS AND HORN SWITCH. (LH H'bar.)



COLOUR CODE

- W White
- Y Yellow
- G Green
- R Red
- O Orange
- B Black
- S Slate
- P Purple
- U Blue
- N Brown
- LG Light Green
- LU Light Blue
- K Pink

4.If test (1) is bad, test (2) OK, but test (3) is bad, pulser unit is u/s or connector fault between pulser and control unit.

Always check connectors first before replacing expensive components.

(u/s = unserviceable)

TIMING SIDE

TIMING COVER REMOVAL

For attention to parts within the timing side the oil should be drained from the front drain plug only. (Alternatively, lean the machine over about 20° to the left). If the timing case is to be removed it is not necessary to remove the fuel tank, silencers, exhaust pipes etc., but the seat should be unlocked, and the right hand side cover detached.

Remove the right footrest and brake pivot bolts; slacken the pillion footrest bolt allowing the foot rest to hang down. If the timing cover is to be removed completely, the clutch hydraulic hose must be detached. To avoid losing hydraulic fluid the pipe banjo can be blocked off, using a 10mm bolt and nyloc nut. Alternatively, the clutch lever may be held to the handlebar with a rubber band. In the latter case, take care when removing the banjo bolt as the fluid will be under slight pressure.

NOTE :- Use new copper washers when refitting hydraulic unions.

If the timing cover is not to be removed completely, it may be swung to one side without disturbing the hydraulic connection. To help prevent damage, pass a length of string through one of the screw holes in the cover and attach it to the passenger grab rail.

When removing the cover it is not necessary to disturb the oil filter cover or clutch hydraulic cylinder. Remove the timing side cover screws; as the cover is removed a small amount of oil will be released. Take care not to bend the clutch push rod. Lift off the cover and allow the oil to drain out from the oil cooler pipes in the crank case.

NOTE :- The two dowels on the joint face will normally remain in the timing cover.

OIL FILTER

Remove the oil filter cover and oil filter. This is most conveniently done before the timing cover is removed from the engine.

OIL SEAL REPLACEMENT

Remove the four countersunk screws (2.5mm Allen key) retaining the oil seal filter union, from the inside of the cover. Should the screws be difficult to remove, a smart blow with the flat face of a drift square onto the head surfaces will enable them to be unscrewed.

The old seal should be prised out and the new one pressed into position until it is flush with the surface, with the garter spring towards the oil filter (i.e. hidden when assembled). Lubricate the seal before refitting it to the engine. Do not rely on the threads of the screws to pull the insert back into the cover. The insert should be pressed home before the screws are fitted.

CLUTCH HYDRAULIC CYLINDER

Before working on the clutch hydraulic cylinder, the entire cover should be washed to remove all traces of engine oil, particularly around both faces of the cylinder itself.

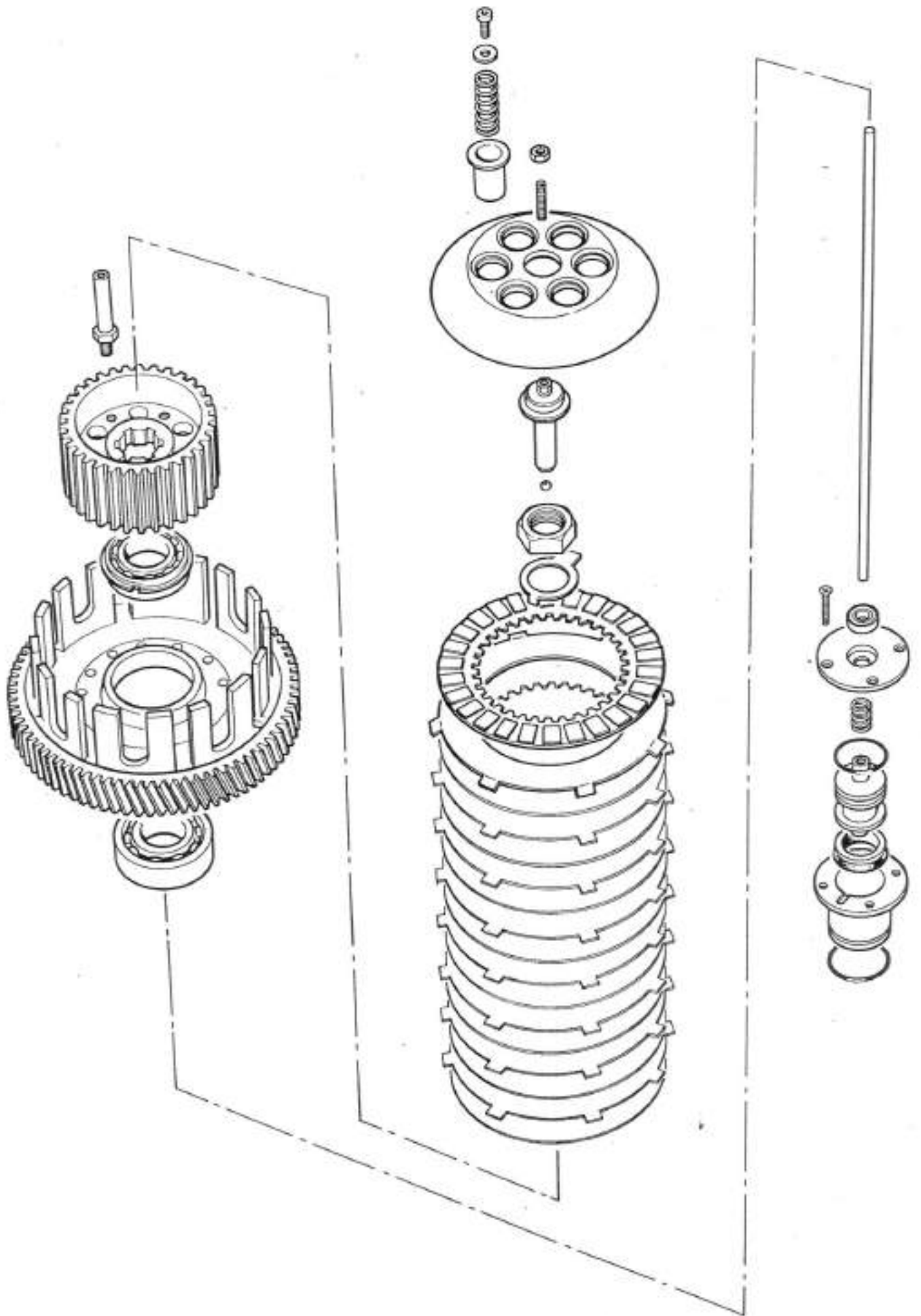
It is recommended that the clutch hydraulic seal and O rings are renewed whenever the cylinder is dismantled.

Remove the four screws (3mm Allen key) holding the oil seal plate to the inside of the timing cover and lift off the plate.

This allows the piston to be lifted out, followed by the spring. The slave cylinder sleeve may then be extracted; should this component be difficult to move, try the effect of levering upwards against the back face using light pressure. The sleeve is only held in place at this stage by an O ring around its outer diameter. It is not normally necessary to remove the plate covering the outside of the clutch cylinder, but this may help when removing a tight sleeve.

NOTE :- When reassembling always use the utmost cleanliness as contamination of the seals with engine oil or solvents will cause them to expand and prevent the clutch from working properly. The hydraulic seal and O rings should only be lubricated with brake fluid, Castrol rubber grease or Silicone grease, NOT conventional oil or grease.

To change the hydraulic seal, run an old rounded screwdriver around the groove to roll the old seal over the end of the piston. Lubricate the new seal and fit it to the groove in the same way, with the lip of the seal facing away from the O ring groove in the piston.



It is easier to assemble the clutch cylinder to the sleeve through the opposite end away from the flange, and then push the piston part way through the flange end before assembling the O ring.

When renewing the oil seal in the inner cover of the slave cylinder, note that the garter spring should face towards the centre of the engine (i.e. visible when assembled).

The complete assembly of the piston and sleeve may then be fitted to the timing cover.

The spring fits around the spigot on the outer end of the clutch piston. A 6mm ball is fitted inside the central hole in the piston to provide an abutment for the clutch push rod. A small quantity of high melting point grease should be introduced into the hole before refitting the cover to the engine.

Note that there is a hole giving access from the inner face of the clutch piston to the outside of the cover. This hole is to allow air to enter and leave the space around the clutch piston as movement occurs. It will also serve as a visible check that the engine oil is not leaking from the seal in the cover, nor the clutch fluid leaking past the hydraulic seal. This hole should not be blocked off.

OIL PRESSURE RELIEF VALVE - 1982 MODELS ONLY

For attention to these components remove the large domed nut next to the oil pressure switch on the outside of the timing cover. (24mm spanner on early machines, 22mm on later models). Remove the threaded sleeve and take out the spring and plunger.

The pressure relief valve seat is a hard steel washer pressed into the bore of the hole. This part does not normally need attention, except to verify that it has not become misplaced during dismantling.

NOTE :- When reassembling, check that all the oil ways are clear, for example by gently blowing through with an air line.

Check that the valve seat is in place. Assemble the domed nut and dowty washer to the threaded adjuster. Fit the plunger and spring in the hole, followed by the threaded sleeve assembly. When the engine is reassembled the valve may be set to the correct pressure (3.5 bars, 50 p.s.i.), by turning the threaded sleeve inwards to increase the pressure or outwards to reduce it. This task should be carried out when the engine oil is at running temperature. The most convenient way to measure the oil pressure is to attach a gauge to the union provided at the top of the timing cover (thread M10x1). (A suitable gauge is available as Service Tool No 8232).

GEAR SELECTOR MECHANISM (DISMANTLING)

To dismantle the gear change mechanism, the valve gear need not be disturbed.

Remove the E clip holding the roller arm in place, and pull off the arm with its spring.

Remove the nut (13mm spanner) on the end of the gear cross-over shaft and collect the plain washer, quadrant assembly and the centralising spring.

Remove the three socket screws (5mm Allen key) and the roller arm pin (10mm spanner) which holds the neutral plunger bracket in place. It may be necessary to ease the bracket from the dowel between the two rearmost screw holes. As the bracket is released, collect the neutral plunger and spring.

The neutral plunger bracket may be allowed to hang from the neutral lead, or it may be placed alongside the two oil cooler connections above the gearbox, whilst working on other parts.

Do not remove the mainshaft nut unless the crankcases are to be dismantled. If this nut is to be removed, replace the footrest holding bolts temporarily to allow the rear brake to be applied. Engage bottom gear and remove the mainshaft nut which has a left hand thread (27mm spanner). If the engine is not in the frame, the mainshaft may be held using the clutch holding tool (Special Tool No 8017) against the alternator rotor.

Before removing the neutral indexing plate, turn the rear wheel whilst applying light pressure on the central socket screw (6mm Allen key) to allow top gear to be engaged. (i.e. with the selector barrel shaft turned fully anti-clockwise).

Remove the socket screw, collecting the washer and neutral indexing plate.

Take off the Seeger circlip and collect the small spacer, inertia arrester gear (star wheel), and the large spacer from the selector rail shaft.

Remove from the selector barrel shaft the slotted spacer, feather key and gear, finally lift off the selector barrel shim-washer.

GEAR SELECTOR MECHANISM (ADJUSTMENT).

Before reassembling the gear selector mechanism, check the following details :-

The pawl arm spring on the gear change quadrant should be set so that the arm hangs in the position shown. Too much tension in this spring may make the pedal reluctant to centralise correctly; too little tension, and the hooks may not engage with the pins on the star wheel when changing down.

Check that there are no burrs or sharp corners on the pawl arm each side of the hooks. These surfaces slide over the pins as the pedal returns to the central position. Rectify if necessary using a slip stone or wet-and-dry abrasive paper.

The eccentric adjuster pin should be set so that the eccentric is farthest away from the splined hole.

When replacing the quadrant onto the cross-over shaft, fit the centralising spring over the splined boss and onto the eccentric. Position the operating arm on the drive side vertically, (unless this has been removed completely) and slide the spring over the locating peg. The spring should engage both the peg and the eccentric without any slack; if necessary bend the arms of the spring slightly using smooth jaw pliers.

GEAR SELECTOR MECHANISM (REASSEMBLY).

Assemble these parts in order to the timing side of the crankcase:

Fit the shim-washer onto the selector barrel shaft; ensure that when this washer is fitted the shoulder of the shaft protrudes slightly through the shim-washer. With a light pull on the shaft a step can be felt between the shim-washer and the shaft shoulder. If in any doubt assemble the whole mechanism and check that a 0.05mm feeler gauge can be inserted between the shim-washer and the crankcase. Replacement shim-washers are available in a range of thickness.

Refit the feather key, the gear wheel with the chamfer against the shoulder on the selector barrel, and the slotted spacer.

Before refitting the neutral indexing plate assemble onto the selector rail the large spacer and the star wheel. Do not fit the small spacer and circlip retaining the star wheel until it has been timed correctly, (see below).

Timing the Star Wheel.

In order to check the timing without removing any parts engage bottom gear, (i.e. with the selector barrel shaft turned fully clockwise); the dot on the tooth of the star wheel should lie on a straight line between the two gear centres, as shown, and in line with the centre of the keyway in the selector.

Refit the neutral indexing plate, plain washer and socket screw (6mm Allen key).

When tightening the socket screw, turn the selector barrel shaft to the bottom position (clockwise so that the neutral notch is uppermost), to avoid stress on the selector forks.

Fit the small spacer and the circlip retaining the star wheel to the selector rail shaft. Ensure that the circlip is locked correctly in the groove of the shaft.

NOTE:- Before continuing to assemble, check that the whole mechanism is free to turn. (Minimum end float 0.05mm).

Place the neutral plunger and spring into its bracket and offer up the complete assembly to its location, threading the neutral wire through the hole in the crankcase. This is most easily done with the plunger engaging the neutral notch of the indexing plate. The three retaining socket screws (5mm Allen key) and the roller arm pivot pin (10mm spanner) should be fitted using Loctite screw-lock.

When this plate is in position, check with a circuit-tester that the neutral light operates correctly. Continuity between the wire and the crankcase should only exist when neutral plunger is in its notch.

Refit the quadrant assembly onto the gear cross-over shaft with the plain washer and self locking nut (13mm spanner).

NOTE:- Adjustment of the eccentric should be left until the roller arm has been fitted.

Fit the roller arm with its spring and locate it with the E clip, noting that the sharp edge of the E clip should face outwards.

Finally adjust the eccentric so that when the machine is in gear, as shown, light pressure on the quadrant gives equal movement in either direction. If the eccentric is not properly set, the system will work well when changing up, but not when changing down, or vice versa. Adjust when in second gear.

To adjust the eccentric, hold the pin with a screwdriver and slacken the locking nut (8mm spanner). The screwdriver may then be turned up to 90° in either direction to give the correct adjustment, and the nut locked up. Do not move the pin more than this as the eccentric should be set away from the cross-over shaft.

When refitting the cover, check that the clutch push rod is in place in the mainshaft, and that the O rings on the oil feed pipes are in good condition (one in the crankcase, one in the cover). Use silicone RTV sealant around the cover joint face. Any old sealant is best removed by rubbing vigorously with a coarse cloth.

NOTE:- When refitting the timing cover, the two longest screws fit where the dowels locate the cover. The shortest screws fit below these screws and the remaining screws above them.

If difficult gear selection has been experienced check the condition and lubrication of the ball joints, and pedal pivot bush below the left footrest.

OIL PUMP

For access to the oil pump, the timing cover must be removed (page 1). Remove the three button headed screws (5mm Allen key) and lift the timing steady plate, leaving the thrust washers and spindles in place. It is not necessary to remove the timing steady plate completely.

Remove the three socket screws (5mm Allen key) and washers holding the oil pump housing to the crankcase.

Lift the oil pump off its dowels and move it downwards to clear the front timing gear. It may be necessary to clear the front timing gear outwards slightly to give clearance for the oil pump. Should the gear be difficult to move, turn the engine over until the front camchain is not under load, i.e. when all four valves are closed. Normally the paper gasket will come off with the oil pump; it is recommended that this gasket is renewed when the pump is refitted.

NOTE:- Take care when tightening the top two oil pump housing screws, as the thread engagement into the crankcase is relatively shallow. 1982 models only.

To dismantle the pump, remove the three socket screws (5mm Allen key), holding the pump to its housing. The pump should be examined for signs of damage, especially to the mating surfaces of the two rotors. The maximum clearances are as shown. When refitting the outer rotor, note that the chamfer on one outer edge should be fitted into the oil pump casting.

In view of the damage that can ensue due to the lack of proper lubrication it is recommended that should any doubt exist on the condition of the pump a new one should be fitted. When refitting a pump, check before fitting the drive gear that oil is drawn up and ejected from the oil feed hole in the housing, when the pump spindle is turned anti-clockwise. To prime a dry pump, turn the spindle clockwise a few times while feeding oil into the oil feed hole. When the pump assembly is renewed it is not necessary to renew the housing which holds the oil pump to the crankcase.

See next page for removal of oil pump drive gear, and details of non-metric spindle thread.

VALVE TIMING GEAR (DISMANTLING)

For attention to the valve timing mechanism the gear selector components need not be disturbed. Should it be necessary to remove either of the camchain cases, the timing steady plate must be removed to allow the gears to be dismantled.

Remove the three large button headed screws (5mm Allen key) and lift off the timing plate, noting that the two dowels will normally remain in the plate.

There is a steel thrust washer on each of the camchain spindles which should be lifted off.

The drive for the valve gear of each cylinder may be dismantled independently.

To release the front drive the oil pump gear or the complete pump assembly, must first be removed.

NOTE:- The oil pump spindle nut is 3/8" U.N.F. If the correct 9/16" A.F. ring spanner is not available, an old 14mm may be used instead.

When the oil pump gear is removed, be sure that the woodruff key on the shaft is also removed, (unless it is firmly held in the keyway) to prevent loss.

To remove the sprocket-gear for either cylinder, the chain should be first released at the cylinder head end with the appropriate piston at TDC on the firing stroke, (check the marks on the alternator).

The spindle on which the sprocket gear rotates is a push fit in the crankcase and should be pulled out to release the gear.

When the spindle is removed the thrust washer between the gear and the crankcase should be collected.

When the sprocket-gear and chain are free, the chain adjuster guide pin may be removed to release the guide, which should be pulled out through the camchain case.

Should any of the spindles be a tight fit in the crankcase they may be removed using a slide hammer; the end of each spindle is tapped 4mm for this purpose.

Examine the chain guides for wear and renew as necessary. The guides should be renewed when the grooves made by the chains are deeper than 2mm.

Premature wear is a sign of incorrect camchain adjustment.

To remove the camchain case release the six socket screws (5mm Allen key) holding the chain case to the cylinder head; and the five socket screws (4mm Allen key) holding the chain case to the crankcase. With the engine in the frame, access to the central screw behind the rear case can be gained by using an extended 1/4" drive bit, (Special Tool No 8229) and a flexible extension. Removal of the remaining screws is simplified by the use of the same tool. To remove the rear chain case with the engine in the frame, it is also necessary to extract the exhaust cam shaft (page 21).

The drive for the front cylinder can be released by following the procedure for removing the mechanism of the rear cylinder. However, in this instance both cam shafts must be removed from the head (page 22), in order to detach the camchain case with the engine in the frame. It has already been noted that the oil pump gear must also be removed.

Later camchain cases have only four retaining screws complete with washer and spacer. **These should be reassembled in the same position.**

Remove the crankshaft pinion which is retained by a right hand threaded nut, (32mm spanner). It may be removed with the engine in the frame by putting the machine into gear and holding the rear brake on. With the engine removed from the frame, the crankshaft may be held using the clutch holding tool to lock the crankshaft (Special Tool No 8017). Do not use a hammer when loosening or tightening either of the crankshaft nuts.

The pinion should not be a tight fit on the crankshaft and may normally be withdrawn without the use of a puller.

Behind the pinion are two steel rings, one of which forms the locating ring for the inner race of the bearing, and the other which fits on the shoulder of the pinion. This latter spacer has a chamfer on the inner collar and should be fitted with the chamfer towards the gear teeth. The bearing ring should be assembled with the identifying number on the outside.

VALVE TIMING GEAR (REASSEMBLY)

Refit the camchain cases as follows :-

It is recommended that the joint be closed using the following parts :-

0543 Dowel

0290 O Ring, diameter = 10mm

0548 Gasket

Silicone RTV sealant

As the rear two 5mm screw holes are drilled through to the crankcases RTV sealant should be applied liberally to the threads of the screws on reassembly.

The camshaft location washers and six O rings should be located in the head using sealant.

The 4-screws in the head should first be assembled finger tight only. Then assemble and pull down the 5 screws into the crankcase. Finally tighten the 4 screws in the head. All 9 screws are fitted with plain washers.

Pass the chain guide blade down through the camchain case, holding it in place by inserting the shouldered pin.

Drop the chain through the chain case retaining it at the top end by, for instance, looping a length of string through the chain and around the frame. Position the sprocket-gear assembly into the loop at the end of the chain.

Fit the pivot pin into its bearings and position the thrust washer on the inside end of the pin. The chamfer on the inner diameter of the thrust washer goes against the should of the pin. The pin may now be pushed into the crankcase bore with the outer flat facing rearwards. Each pivot pin carries a thrust washer on both ends; all 4 washers are identical.

Either chain and sprocket assembly may be fitted independently of the other; it is more convenient to fit these parts before the crankshaft helical gear is fitted. It is not necessary to time the gears when assembling these parts. Refit the crankshaft pinion which is retained by a right hand threaded nut (32mm spanner), page 16.

When all three helical gears are in place, refit the oil pump gear and the 2 outer thrust washers, (chamfer on the inner diameter against the shoulder on the pin). The timing plate may now be fitted using Loctite screw-lock on the 3 button headed screws, (5mm Allen key).

Refit the camshafts and the camsprockets (page 18). If the timing gears at the camshaft end have been disturbed, it will be necessary to re-time each camshaft individually on reassembly (pages 23-24) rather than relying on the sprocket carrier parts having been removed as complete assemblies.

VALVE CLEARANCE

Inlet 0.10 - 0.15mm (0.004" - 0.006")

Exhaust 0.15 - 0.20mm (0.006" - 0.008")

The front cylinder can be attended to with the petrol tank and air filters in place, but for the rear cylinder these parts should be removed.

Please note later or modified engines valve clearance is now:-

Inlet 0.025 - 0.050mm (0.001" - 0.002")

Exhaust 0.025 - 0.050mm (0.001" - 0.002")

Position the engine so that one piston is at TDC on the firing stroke, (i.e. with the reluctor in line with the pick-up as shown).

Remove both valve covers from the cylinder head (7 screws in each 4mm Allen key) and measure the clearance between each cam and cam follower. Record the largest metric feeler gauge which can be inserted between the cam and follower. If this figure is 0.10mm for both inlet valves, and 0.15mm for both exhaust valves, no attention is necessary. If any clearance reading is greater or less than the correct figure, the camshaft must be removed. Should no clearance be present at all, so that no end float can be detected by finger pressure on the camshaft, it is possible that damage to the valves or seats has occurred. In this case it is recommended that the cylinder head should be removed for examination of these parts. If the lack of clearance is due simply to a mistake in shimming the valves, and the engine has not run for more than a few minutes, no damage should have been caused. To confirm this, a compression check should be made

when the correct clearance has been obtained. Both cylinders should show similar readings of 10 bars minimum (150 psi) at cranking speeds. Throttle held open and HT leads both earthed.

The valve clearances may of course be set on a detached cylinder head before refitting to the engine.

VALVE ADJUSTMENT

Take off the V1000 cover to reveal the camshaft drive (10 screws 4mm Allen Key), removing the oil feed screws if necessary to allow the front cover to slide away.

Fit the camshaft timing tool (Special Tool No 8016) across the aperture above the camshaft to be removed so that the prongs locate in the camshaft slots, and secure the tool with two M5 screws. (Only two holes will be found to align with the tool).

Do not use the timing tool to tighten or remove the camshaft nut but use a 16mm spanner on the location flats.

Release the nut holding the sprocket assembly to the camshaft, noting that it has a left hand thread, (32mm ring or socket spanner).

It is possible to remove the nut without use of the holding tool by the use of a 16mm spanner on the camshaft flats. Do not be tempted to loosen the nut against camchain tension or damage may be caused.

With the nut removed the appropriate camshaft bearing housing should be removed from the left of the cylinder head. In the case of the rear exhaust camshaft the reluctor and pick-up plate should be taken out (13mm spanner, 4mm Allen key), to give access to the screws holding the housing to the head, (5mm Allen key).

The shims can be fitted either way up. When the valve clearance is correct, refit the sprocket assembly and locate the sprocket nut finger tight. It may be necessary to centralise the thrust washers between the camchain case and head when inserting the camshafts, using a small screwdriver. Do not forget to turn back any jacking screws before refitting the bearing housing, and use silicone RTV sealant on the mating faces.

VALVE TIMING

If the valve timing has been lost by dismantling the sprocket assembly, or when the crankcase timing gears have been disturbed, proceed as follows:-

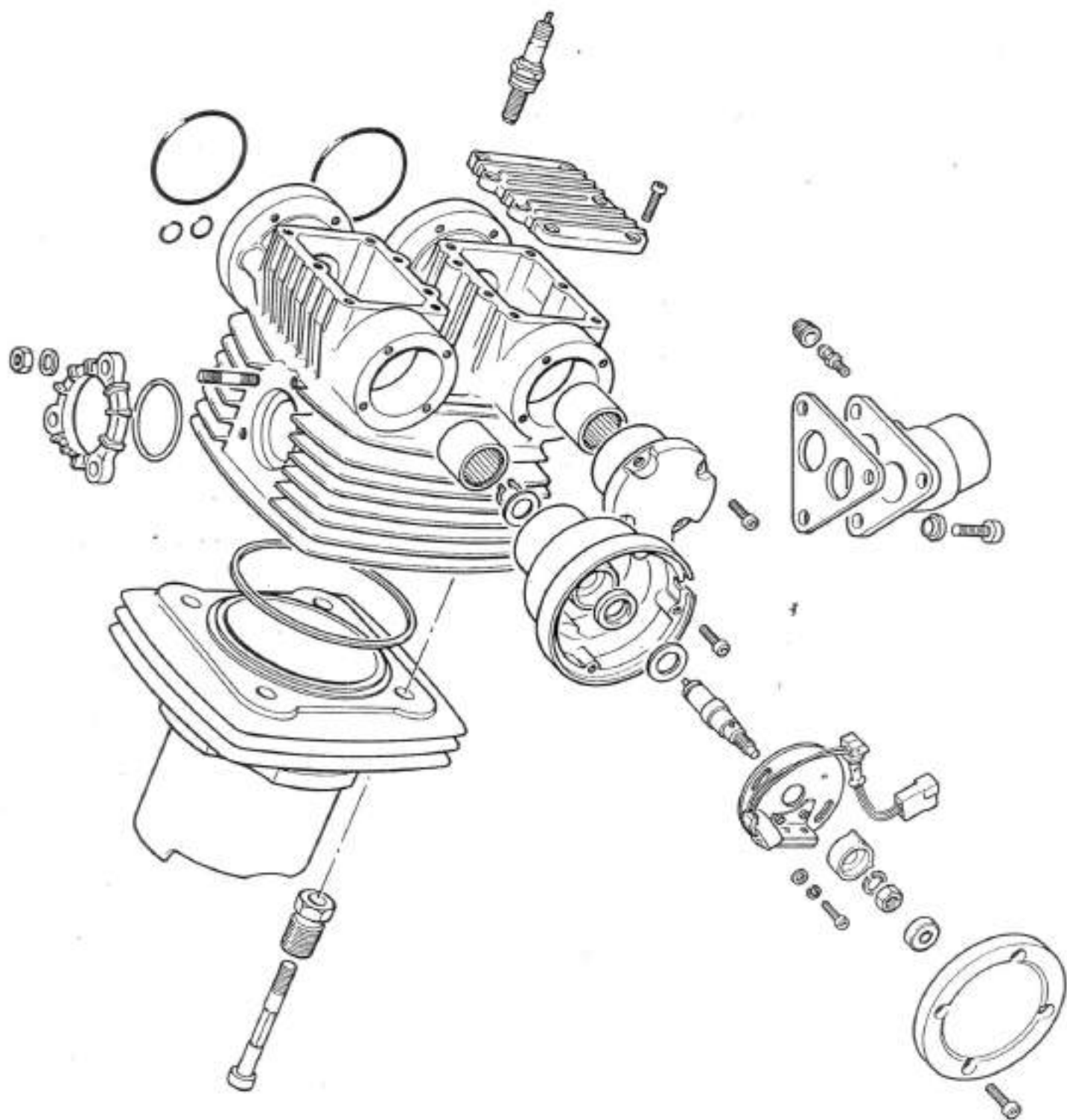
Position the engine so that one piston is a TDC on the firing stroke, (check the marks on the alternator). Fit the camshaft timing tool (8016) onto the cylinder head to hold the camshaft in place, (page 21). If both camshafts are removed, it is necessary to fit the sprocket assembly to the exhaust camshaft first.

Fit the woodruff key and sprocket retaining plate to the camshaft. Offer up the sprocket, moving it round in the chain until the plain hole in the retaining plate aligns exactly with a sprocket hole.

Should any of the three remaining bearing housings seem difficult to remove, tighten the two small jacking screws to lift off the housing, (2.5mm Allen Key). Take care when removing one camshaft that the chain does not slip around the sprocket of the other; it may be helpful to release the screw holding the chain adjuster (6mm Allen key). If both sprockets are removed take care that the chain does not drop down into the camchain case.

When the bearing housing and the camshaft timing tool (8016) are removed, the camshaft may be withdrawn through the sprocket assembly without disturbing the timing. A loop of wire or string through the sprocket assembly will hold the chain in place on the sprocket while the shims are changed.

Should the camshaft be difficult to remove it is possible to take off the sprocket retaining plate and sprocket, allowing the sprocket carrier to be pulled off or prised away from the camshaft. Do not lever against the sealing face of the cover but against the back surface which is supported by the cylinder head. Instead, if a



small puller is available, the three tapped holes in the sprocket carrier may be used to dismantle the assembly; the holes are tapped M5.

The cam follower buckets may be removed with a small magnet or a valve-grinding sucker.

Lift out the shim and read off its thickness. The number marked is the thickness in hundredths of a mm; should the number be illegible a vernier calliper or micrometer should be used. Fit a thicker or thinner shim as required and replace the follower, camshaft and bearing housing loosely to allow a check to be made on the clearance.

While offering up the sprocket, hold the chain tight by finger pressure on the chain adjuster blade, so that the chain is in the normal running condition with no slack. When the hole nearly lines up it is helpful to turn the sprocket 3 teeth at a time to find the exact position. The peg on the sprocket retaining washer should push into place without any relative movement of the sprocket and plate. Before tightening the nut check that the engine has not moved from TDC. Leave the tool in place on the head and tighten the nut to 50Nm (37 foot pounds, 5 Kpm). Should the camshaft timing tool (8016) not be available, do not be tempted to tighten the nut against camchain tension; use a 16mm spanner on the camshaft flats (if no 16mm is available, a 5/8" A.F. may serve).

When refitting the covers note the lengths of screws.

| | |
|---------------------------|------------------|
| Ignition housing to head | 4 screws M6 x 20 |
| Pick-up housing | 2 screws M5 x 12 |
| Ignition cover to housing | 4 screws M5 x 16 |
| Bearing housings to head | 4 screws M6 x 16 |
| Cambox covers to head | 7 screws M5 x 16 |

| | |
|-----------------------|------------------|
| Camchain covers V1000 | |
| Centre right | 1 screw M5 x 25 |
| Top 3 bosses | 3 screws M5 x 20 |
| Remaining screws | 6 screws M5 x 12 |

The covers should be sealed with silicone RTV sealant, (except the ignition timing cover which is assembled dry).

The ignition timing has been disturbed and requires setting together camchain adjustment .

IGNITION TIMING

Ignition timing can only be set when the cam timing and chain setting are correct. The reluctor is driven from the exhaust camshaft and care should be taken when timing the fixing nut, or damage can be caused to the driving blade on the reluctor spindle.

If the ignition pick-up assembly has been moved on its backplate, it is first necessary to set the radial clearance between the poles of the reluctor and the core of the coil to 0.25mm (0.01 inches), using a feeler gauge. This can be done by turning either the back plate or the engine until the two poles line up.

To alter the clearance; slacken the two posidrive screws holding the pick-up to the back plate allowing the pick-up to be rotated. This operation will not be necessary if the pick-up and the back plate have been removed together.

The alternator cover on the left hand side of the engine should be removed to reveal the timing marks, (T=TDC, F=Firing point at 3,000 rpm). This will enable the engine to be run with the stroboscope connected to one plug lead. As the engine has an "idle spark" ignition system both cylinders may be checked at the same time by connecting the strobe to the more accessible front H.T. lead.

T=T.D.C.
F=Firing @ 3000 rpm =22°
Full Advance = 34

If the timing is found to be incorrect stop the engine and remove the ignition pick-up cover on the rear cylinder head. Slacken the two socket screws holding the back plate to the housing allowing the pick-up to be rotated :-

Clockwise : to advance the ignition

Anti-clockwise : to retard the ignition

Tighten the two socket screws, and refit the ignition pick-up cover before rechecking the timing, as the cover includes an outrigger bearing for the ignition spindle.

Later engines (1996 on) with the computer controlled spark advance are timed at the factory and do not require adjustment provided that the timing marks line up on the cam gear.

CAMCHAIN ADJUSTMENT

The camchains should be adjusted when the engine is cold. Remove the 10 socket screws (4mm Allen key) holding each cover to the head and lift off the covers. To remove the front cover it will be necessary to remove the two oil feed screws before sliding the cover off.

Engage top gear, by rotating the rear wheel turn the engine until the appropriate piston is at TDC on the compression stroke, with the ignition reluctor in position A for the front cylinder.

Position B for the rear cylinder.

Slacken the chain guide adjuster screw (8mm Allen key) and move the guide until there is 3mm of movement in the top run of the chain. Check the movement when the retaining screw has been tightened by holding the chain between finger and thumb. No gasket is fitted to the cover; use a smear of silicone RTV sealant around the point faces. For details of screw sizes see page 24.

REMOVAL OF THE CYLINDER HEAD AND BARREL

The front cylinder head and barrel may be removed when the front exhaust pipe and carburettor have been disconnected. To remove the rear cylinder head and the barrel, the following parts must first be removed :-

Exhaust system

Front and rear air boxes

Front apron assembly

Plastic side panels

Oil cooler pipes

It is also more convenient to release the oil cooler pipes at the crankcase end. To do this, slacken the union at the oil cooler end (11/16" A.F.) to allow the pipes to be rotated. Then slacken the crankcase fittings (5/8" A.F.) and rotate the pipes to release them.

It is not necessary to dismantle the drive side or timing side engine covers; however, it is more convenient if the camchain cases are removed and this necessitates removal of the timing side cover .

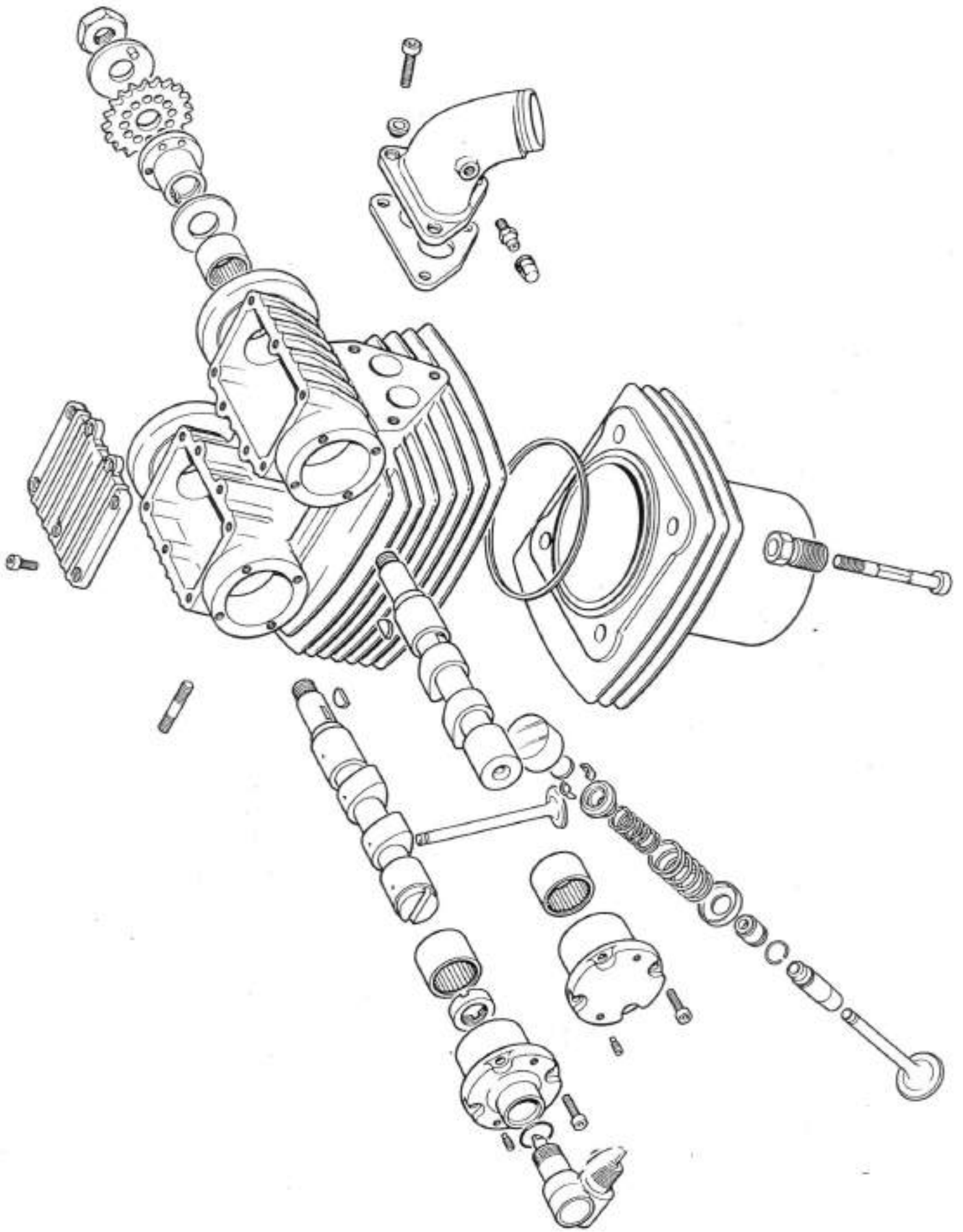
Proceed as follows :-

Remove the camshafts, noting first the relevant valve clearances for reassembly.

Slacken each carburettor from its stub and allow it to hang from the cable. When removing the front carburettor is helpful to remove the manifold from the head (6mm Allen Key) to avoid damaging the throttle cable.

To remove the cylinder heads the four tie rods must be unscrewed from the head.

Slacken the sleeve nuts (18mm) holding the tie rods into the crankcase, by about 1 turn. Should the sleeve nuts not yield to normal spanner pressure, release the stiction of the threads by striking one of the sleeve nut flats smartly, using a flat ended drift.



Once the tension on the sleeve nuts is released the tie rods may be unscrewed from the head; noting that the fixing into the head is of necessity a left hand thread, (8mm.)

Note :- Do not attempt to turn the tie rods until the sleeve nuts have been released.

Take care when releasing the last tie rod on the front cylinder, that the head does not fall off or the valve buckets drop out.

When the head is released the cylinder barrel may be eased from the crankcase taking care as the barrels are removed not to damage the piston assembly.

Note :- Do not disturb the barrels needlessly.

The easiest way to refit the barrel is to first assemble the piston into the barrel, and then onto the rod; alternatively the piston may be left in place and located by means of a wooden peg through the gudgeon pin, while the rings are eased into the cylinder bore. Ring compressors are not necessary.

The gudgeon pin is a sliding fit in both piston and rod and may be removed from either side. The plain wire circlips must be renewed when reassembling and should be fitted with the gap 3-4mm on either side of the extraction slot.

The head gasket is a spring steel ring and need not be renewed every time the engine is dismantled. The steel edge on the ring should be located against the top of the cylinder barrel. No gasket is fitted round the cylinder base, but a smear of silicone RTV sealant should be applied before closing the joints.

The two cylinder heads are identical so should be identified to avoid confusion upon reassembly. The barrels differ only in the position of the cut-away on the cylinder liner, the cut-away on the front cylinder is to the right side when assembled.

REMOVAL OF THE VALVES, GUIDES AND SEALS

The valve springs and collets are of conventional type. Compress the springs in the normal manner and remove both collets from each valve. Take care not to damage the cam follower bores.

A magnetic probe is the most convenient tool for removing and replacing collets; alternatively the collets may be stuck to the end of a long Allen key using stiff grease.

Examine the valve springs for length, as shown, and renew them if necessary. In view of the damage which can be caused should a spring fail in service and the moderate cost of replacements, it is recommended that the springs are renewed whenever the valves are disturbed.

Valve outer 33mm minimum

Valve inner 32 mm minimum

Before replacing the valves they should be lapped to the seats using fine grinding paste in the normal way. Should fine paste not enable a good seal to be achieved it may be necessary to re-face the valve or to re-cut the seat.

If metal is removed from the valve seat or head, check before refitting the cylinder head to the machine that the correct valve clearance can still be achieved using the shims available. If necessary a small amount of metal may be removed from the stem of the valve, ensuring that the surface remains square to the valve stem. In such cases a better solution is to renew the valve itself.

VALVE GUIDE OIL SEALS

An oil seal is fitted to all 4 guides in each head. These seals should be renewed as a matter of course whenever the valves are disturbed. Lubricate the valves and seals with engine oil on assembly.

VALVE GUIDES

The standard clearance between the valve and guide is :-

Inlet 0.026mm
Valve to guide 0.051mm

Exhaust 0.039mm
Valve to guide 0.064mm

If suitable measuring equipment is not available guide wear may be estimated by inserting a new valve until the end of the valve is flush with the end of the valve guide. Rock the valve to and fro in this position and measure the maximum movement of the head of the valve. The guide should be renewed when this movement exceeds 0.05mm.

To remove a valve guide from the cylinder head, heat the head to 200°C. Apply engine oil to the guide area and drive out the guide using a shouldered drift (Special Tool No. 8230).

To fit a new guide the head should again be heated, and ideally the guide should also be cooled in liquid nitrogen or freezer. Fit the guide using Special Tool No 8231. If this is not available take particular care that the method used does not drive the circlip into the aluminium alloy of the cylinder head.

Note : Take particular care in view of the extremes in temperature of the cylinder head and the new valve guide, which should not be handled with bare hands.

DRIVE SIDE

PRIMARY DRIVE (DISMANTLING)

Drain the engine oil by removing the front drain plug only. (Alternatively, lean the machine over about 20° to the right).

Remove the footrest socket screw (8mm Allen key) and the gear operating arm from the cross-over shaft (5mm Allen key), allowing the pedal and its mechanism to hang down. Refit the screw and washer to the gear arm to avoid confusing it with the cover screws (which are longer and have no washers).

Detach all 3 alternator wires from their connections. It is not necessary to remove the alternator cover, filler cap or clutch adjustment cover.

Release the 13 socket screws around the drive cover, (5mm Allen key).

Even when the engine oil is drained a small quantity of oil may drain from the cover as it is released. Take care that the thrust washer on the front starter chain spindle is not lost when the cover is removed.

The clutch assembly can be dismantled without disturbing the starter drive. Remove the 6 socket screws (4mm Allen key) holding the clutch springs in place, noting as each screw is released that the spring is under light pressure.

Take care when removing the clutch pressure plate that the 6mm ball inside the operating mushroom is not lost. The plates may be removed with the fingers; the last two plates may need the use of a small wire hook for access. Examine the plates for signs of overheating which will show as surface discoloration and lack of flatness.

Check the friction plates for wear; the standard thickness is 3.25mm and they may be used until they are worn down to 2.75mm. As the plates wear the pressure exerted by the clutch springs is reduced. If the thickness of the assembled plate becomes less clutch slip may occur.

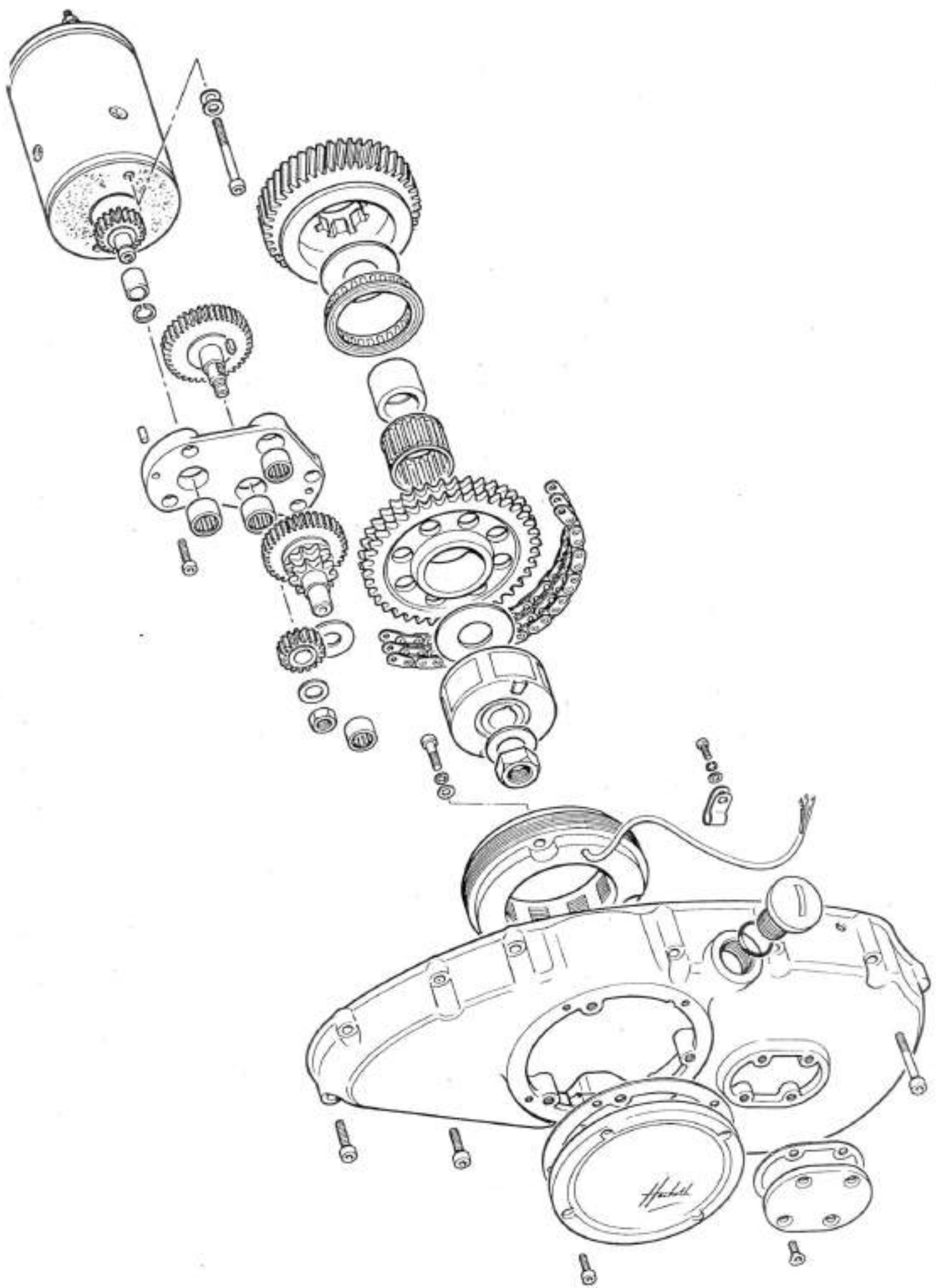
If overheating of the plates has occurred, it is quite likely that the clutch springs will have been affected. The standard spring length is 36mm and the springs should be renewed unless their length exceeds 35mm.

After a considerable mileage burrs may form on the driving teeth of the clutch plate. Unless the slots in the outer drum and the splines in the inner drum are severely notched this should have no effect on the clutch performance. Any burrs present should be removed with a fine file.

Notches in the slots or splines of the clutch will cause difficulty in freeing the clutch under load and any parts showing wear of this kind should be renewed.

To remove the clutch assembly from the gearbox mainshaft the clutch holding tool (8017) should be used to lock the clutch. The arm of the tool may be locked against the frame or the alternator rotor, but not against the gear cross-over shaft. Loosen the clutch nut (32mm RH thread) to release the clutch inner drum.

The alternator must be released to allow the starter sprocket to be lifted off, should it be required to remove the clutch outer drum. The alternator rotor nut should be removed while the clutch tool is in position (32mm LH thread). Check the condition of the bearings in the clutch outer drum before refitting it. This



drum fits on the shaft without any spacer behind it. Should the bearings need to be renewed, remove the circlip from around the smaller of the 2 bearings and press both bearings through from that side.

To remove the starter drive release the alternator rotor nut, see above, and pull off in turn the alternator rotor, thrust washer and sprocket assembly. As the sprocket is removed the chain and front sprocket is removed, the chain and front sprocket will pull from the starter bearing plate.

Within the large starter sprocket is a needle roller bearing, which runs on a sleeve which is a push fit on the crankshaft. It is not necessary to remove the alternator feather key to remove these parts.

The primary drive gear contains the starter sprag clutch which is held in place by a large circlip. The sprag clutch may be removed by gently levering against its back face with a pair of levers, such as small Allen keys. Behind the sprag clutch is a steel thrust washer.

Check the sprag clutch for wear (flats on the rollers) and replace as required.

Note which way around it fits for assembly.

Should the primary drive gear be tight on its splines, use a puller around the outer flange to extract it. Unless the crankshaft is to be removed it is not normally necessary to remove this gear.

For access to the starter motor on early machines, it is necessary to release the starter bearing plate to reach the starter fixing screws. Later models have a cut-out in the top front edge of the starter bearing plate, and it is recommended that this modification is carried out on earlier machines when convenient.

All that is required is to file a small depression in the top edge in line with the top starter motor screw so that the 2 starter screws may be removed without disturbing the bearing plate.

Even on machines without this cut-out it is not necessary to remove the starter bearing plate or starter chain assembly completely. Once the 4 screws holding the starter bearing plate to the crankcase are removed (5mm Allen key), the plate may be pulled off its dowels for access to the starter screws.

The starter screws themselves are screwed into the yokes of the starter motor and have a B.S.F. thread. Consequently an Imperial Allen key is required (3/16" A.F.). A Special Tool No 8228 is available for areas where Imperial tools are not readily obtainable.

Before removing the starter from the machine release the lead, (10mm spanner) and allow it to hang from the crankcase. As the starter motor is extracted it may be necessary to rotate it a little, to allow the terminal screw to clear the crankcase. Keep the 2 starter screws attached to the starter motor, to avoid any risk of getting them mixed up with the metric screws used elsewhere on the machine.

The gear cross-over shaft may only be removed when both the engine side covers are off. Whilst working in the primary case do not disturb the three crankcase screws; two 6mm screws in the front and one 8mm screw above the lay shaft, unless the crankcases are to be separated. The 8mm screw beneath the gearbox mainshaft retains the inner bearing sleeve for the gear selector spindle and should not be disturbed.

PRIMARY DRIVE (REASSEMBLY)

If the timing cover is not fully assembled, it is convenient before fitting the primary cover to tighten the nuts on the gearbox mainshaft and crankshaft using the clutch holding tool (8017), to prevent engine rotation. Alternatively, these parts may be fitted and tightened by engaging top gear and applying the rear break, once the engine assembly is complete.

When replacing the primary drive cover ease the alternator lead below the frame lug and engage the gear change cross-over shaft with its bearing. The alternator magnetism will pull the cover inwards; take care that the oil seal slides over the shoulder on the cross-over shaft.

The three longest screws fit in the top three holes in the cover, the shortest screws fit around the bottom of the cover and the remaining three screws fit the other holes.

The alternator wires may be connected in any sequence to the three identical harness connections. Ensure that the bullets are pushed well home into the rubber sleeves.

REMOVAL OF THE ENGINE FROM THE FRAME

In order to remove the engine from the frame the following operations must first be performed :-

Lift the motorcycle onto the centrestand.

Pull off the plug leads from both sparking plugs.

Unscrew the tachometer drive from the engine.

Unscrew the jubilee clip from the front air box connector rubber and detach the connecting pipe from the front carburettor.

Push the rear air box connector rubber back into the rear air box.

Remove the front air box. Separate the fuse-box from the rear air box and allow it to hang from the harness; remove the rear air box.

Disconnect the engine breather pipe from the camchain case.

Remove both oil cooler pipes from the oil cooler end.

Cut all the ties retaining the oil cooler hoses.

Remove the exhaust system complete.

Note : The exhaust clamps are held tight with stainless steel fastenings. Do not confuse these with similar not-stainless fixings elsewhere on the machine.

Disconnect the gear change linkage and foot rest assembly.

Remove the foot brake pedal and pivot bolt, allowing it to hang. Take particular care not to loose the bronze bearing.

Slacken the clutch hydraulic bolt on the timing cover.

Pull back the clutch lever, tying it back to the handlebars with tape or a rubber band. A small amount of fluid will be ejected around the banjo bolt when this is done.

Remove the banjo bolt from the clutch pipe and collect the copper washers. Loosely refit the banjo bolt to avoid any damage to the sealing face.

Disconnect the neutral light and oil pressure switch wires.

Remove the lower cable (starter motor) from the solenoid. Disconnect the alternator leads adjacent to the solenoid.

Remove the front bolt on the rear brake torque stay. Release the stay and refit the bolt to the centre stand; do not tighten the bolt excessively at this stage as the outer crankcase lug is unsupported.

Disconnect the chain link and remove the drive chain.

Remove the screws from the front carburettor manifold, collecting the insulator bushes and gaskets.

Slacken the pinch bolt on the rear carburettor and slide it from the stub.

Place a jack or suitable block under the front of the sump, to support the engine. If using a jack, ease it up until the three engine mounting studs slide out. Alternatively they may be driven out with a soft metal drift, taking care not to damage the threads. Note that the front engine bolt is the shortest of the three.

If no assistance is available, the wheels and front mudguard should first be removed to enable the frame assembly to be lifted from the engine. Alternatively, it is possible to support the engine on wood strips front and rear (not the centre stand) and remove the strips one at a time, allowing the engine to drop gradually until it is at ground level. Whatever method is used, there is a danger of damage to the surface finish of both frame and engine unless great care is taken. This risk of damage is reduced if the V1000 covers and the ignition housing are removed from the engine whilst it is in the frame.

Note :- It is more convenient before refitting the engine to remove the chain guard from the swinging arm to avoid damage the front end of the guard.

Once the preparations are complete, the three mounting bolts are all that connect the engine to the frame.

Lift the rest of the motorcycle up and away from the engine.

ENGINE (DISMANTLING)

SEPARATING THE CRANKCASES

To separate the crankcases the head, barrels and pistons must be removed (pages 27-29), along with the contents of the timing side (pages 1,5-6, and 12-17) and drive side (pages 33-37). The tie rods need not be removed from the crankcases, but it is more convenient to remove them at this stage so that they can be properly lubricated before reassembly. Allow the engine to stand for a few minutes with the rear slightly raised, so that any oil remaining in the crankcase drains out through the front drain plug. The rear drain plug should also be removed to allow any oil remaining in the gearbox compartment to be drained.

Remove from the drive side eight 6mm screws, (5mm Allen key).

Note :- Two of these screws are on the inside of the cover adjacent to the starter motor.

Take out the 8mm screw (6mm Allen key) above the layshaft. It is not necessary to disturb the screw beneath the mainshaft.

From the timing side remove the three 8mm screws (6mm Allen key) around the output sprocket boss, and the three similar screws within the timing case itself. The shouldered pin near the gear cross-over shaft bearing need not be disturbed.

If it has not been removed take out the oil feed union from inside the timing chest (17mm spanner). Lay two strips of hardwood about 10mm thick and 300mm long on the bench; rest the engine assembly onto the strips with the drive side uppermost, so that the wood supports the outer crankcase face allowing the crankshaft to protrude. Once the screws are removed the crankcases may be separated. No gasket is used between the cases and separation should not normally be a difficult operation; avoid the temptation to hit the forward extensions of the crankcases when separating the two halves.

When the drive side case is lifted off, check the position of the four large shim-washers on the gearbox shafts, as these may remain located within the drive side case.

Once the cases are separated the crankshaft may be removed by lifting it from the timing side main bearing.

Conrods removed by 11mm socket to inspect shells. Note that the rear cylinder shell set and conrod is different to the front on later models. Remove one bung and inspect oil trap in crank and clean out. Replace bung with new one and loctite.

Big end bolts torque to 35ft lb.

If an engine overhaul is being undertaken, remove also the oil pick-up assembly (4mm Allen key).

Lift out the gear spray tube from behind the rear cylinder.

Remove the output shaft as a complete assembly.

Lift off the idler gear assembly along with the needle roller bearing and two thrust washers; pull out the rear (layshaft) selector spindle.

Lift out the front (mainshaft) selector spindle from its location in the crankcase, and slide the two rear selector forks out of engagement with the selector drum.

The selector drum may then be lifted out, noting that a thrust washer is fitted between the end of the drum and the timing side crankcase.

The gears on the mainshaft and the layshaft may now be removed, noting carefully the positions of all the spacers and bearings, until only two gears remain on the layshaft and three on the mainshaft.

The layshaft may now be lifted out leaving the gears in place. The remaining gears should be removed as a set along with the selector fork, bearings and spacers.

Should the mainshaft be tight in its bearing, the crankcase may be lifted back into the vertical position. A light blow from a soft faced hammer is normally sufficient to dislodge the mainshaft from its bearing.

Unless damage has occurred, it is not necessary to remove the idler gear shaft which is retained by three 6mm socket screws (5mm Allen key) around the edge of the casting.

ENGINE (REASSEMBLY)

The following instructions are written on the assumption that the gearbox is being reassembled without any changes to the constituent parts. Should it be necessary to renew any parts of the gear box assembly it may be necessary to select different shim-washers.

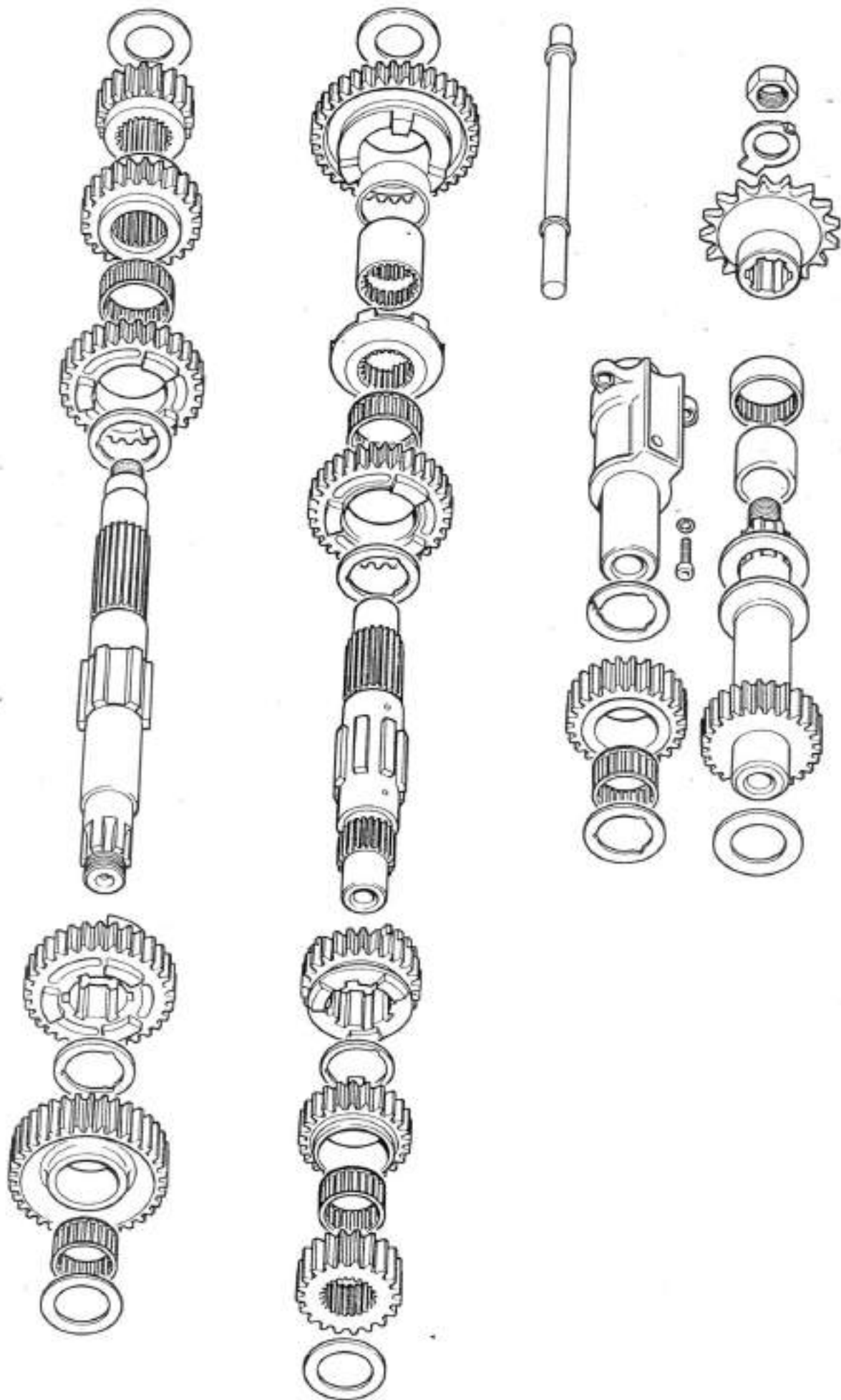
Although the gearbox assembly is shimmed when build it will not be necessary to select new shims, if a complete gearbox is being transferred from one set of crankcases to another.

Assemble the gearbox parts in order into the timing side crankcase:

Fit the idler shaft with its socket screws using Loctite screw-lock on the screws, (5mm Allen key).

Assemble onto the right hand end of the mainshaft (fine splines) the following parts :-

| | | |
|----------------|---|---|
| Spacer | A | Outer chamfer facing right. |
| 3rd gear | B | 28 teeth, dogs facing left. |
| Needle bearing | C | |
| 2nd gear | D | 24 teeth, longer shoulder facing right. |
| Bottom gear | E | 20 teeth, longer shoulder facing right. |



Thrust washer F Inner chamfer facing left.

Insert mainshaft into its bore in the crankcase (needle roller and ball bearing).

Assemble onto the right hand end of the layshaft (longer fine splines) the following parts:-

| | | |
|----------------|---|----------------------------|
| Spacer | A | Outer chamfer facing right |
| 2nd gear | B | 32 teeth, dogs facing left |
| Needle bearing | C | |
| Dog ring | D | Dogs facing right |
| Splined sleeve | E | Inner chamfer facing right |
| Bottom gear | F | 36 teeth, dogs facing left |
| Thrust washer | G | Inner chamfer facing left |

At this stage 2nd gear should rotate but not slide; bottom gear should rotate and slide in and out of engagement with the dog ring.

Assemble onto the central portion of the layshaft the following parts:-

| | | |
|----------------|---|--|
| 3rd gear | A | 28 teeth, selector groove facing left |
| Spacer | B | Inner chamfer facing right |
| 4th gear | C | 25 teeth, dogs facing right |
| Needle bearing | D | |
| Top gear | E | 22 teeth, longer shoulder facing right |
| Shim-washer | F | Inner chamfer facing right |

At this stage check that 4th gear will rotate but not slide, and that 3rd gear will slide but not rotate.

Insert the layshaft assembly into its bearing in the crankcase.

The selector forks may be identified by the inside diameter of the forks and the position of the pin. The two layshaft forks have the pins offset away from the fork itself.

The pin on the mainshaft selector is in line with the centre of the selector rail.

Assemble the two layshaft selector forks into their grooves, allowing them to rest against the crankcase. The fork with the larger internal diameter goes into the 1st gear, deeper in the crankcase. Do not fit the selector rail at this stage.

Assemble onto the mainshaft the following parts:-

| | | |
|----------------|---|--|
| 3rd gear | A | 28 teeth, selector groove facing right |
| Spacer | B | Outer chamfer facing left |
| Top gear | C | 34 teeth, dogs facing right |
| Needle Bearing | D | |
| Shim-washer | E | Chamfer facing right |

Assemble the mainshaft selector fork onto the longer selector rail with the selector pin towards the shouldered end.

Fit the rail into the crankcase so that the fork engages the groove in 4th gear. Do not push the selector rail fully home at this stage.

Fit the shim-washer to the selector drum with the inner chamfer against the shoulder of the drum.

Position the selector drum in the crankcase bore, ensuring that the pins of the selectors engage in the grooves of the drum. It may be necessary to manoeuvre the gears along their shafts a little to allow both selector rails to be pushed fully home.

At this stage check that when the selector drum is turned all, three forks move to and fro. To do this, turn the mainshaft with one hand to allow the dogs to move in relation with each other while turning the selector drum with the other hand. It is not necessary to leave the selector drum in any particular position.

Assemble onto the idler shaft in the crankcase the following parts:-

| | | |
|---------------|---|--|
| Thrust washer | A | |
|---------------|---|--|

| | | |
|----------------|---|--|
| Idler gear | B | 25 teeth, longer shoulder facing right |
| Needle bearing | C | |
| Thrust washer | D | |

Note that the grooved faces of the thrust washers face towards the gear.

Fit onto the final drive shaft assembly the shim-washer, with the inner chamfer to the gear face. Fit the spacer onto the splined end of the shaft, with the chamfer over the shoulder. This spacer fits over a bearing ring which is a press fit onto the shaft, and need not normally be removed.

Fit the completed final drive shaft assembly into the bearing bore in the crankcase.

In case of any doubt it is possible at this stage, to assemble the gear selector mechanism into the timing side aperture, so that a thorough check may be made on the gear selection in each gear position.

Check that the O ring is located on the oil pick up assembly. Fit the assembly into the crankcase using Loctite screw-lock on the fixing screws.

Fit the crankshaft assembly into the timing side main bearing, with the timing side rod to the rear and the drive side rod to the front of the crankcase.

Finally insert the gear oil spray tube, locating the notch on the shoulder into the slot in the timing side crankcase.

JOINING THE CRANKCASES

Before fitting the drive side crankcase check the following points:-

One solid end and one hollow dowel are fitted to the mating faces.

The gear selector drum support is fitted between the selector rail locations in the drive side case.

From Engine No 0156 there is a groove machined in the driveside crankcase. This groove contains a sealing cord, which should protrude slightly (1mm) above each barrel face when the cases are bolted up.

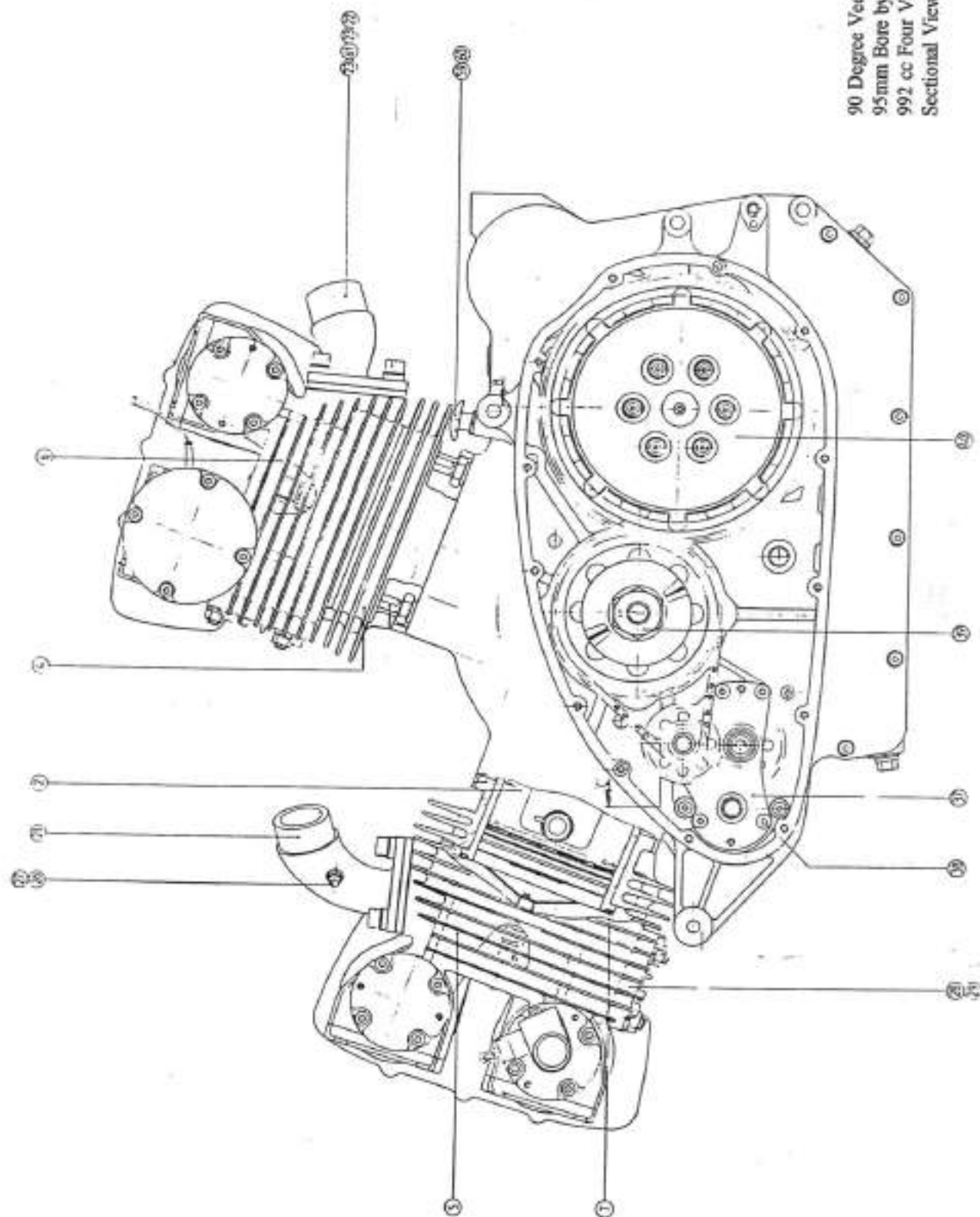
Place a smear of silicone RTV sealant around all the out crankcase faces and locate the drive side to the timing side.

Should any difficulty be experienced when joining the crankcases, remove the drive side crankcase and check the heights of the gearbox parts.

Fit the nine screws passing from the drive side to the timing side crankcase.

Fit the three screws around the gearbox output shaft and the three crankcase screws within the timing cover. These screws should all be fitted and tightened before the gasket compound hardens.

HESKETH V1000 ENGINE



90 Degree Vee Twin
95mm Bore by 70mm Stroke
992 cc Four Valve Head
Sectional View - Drive Side

