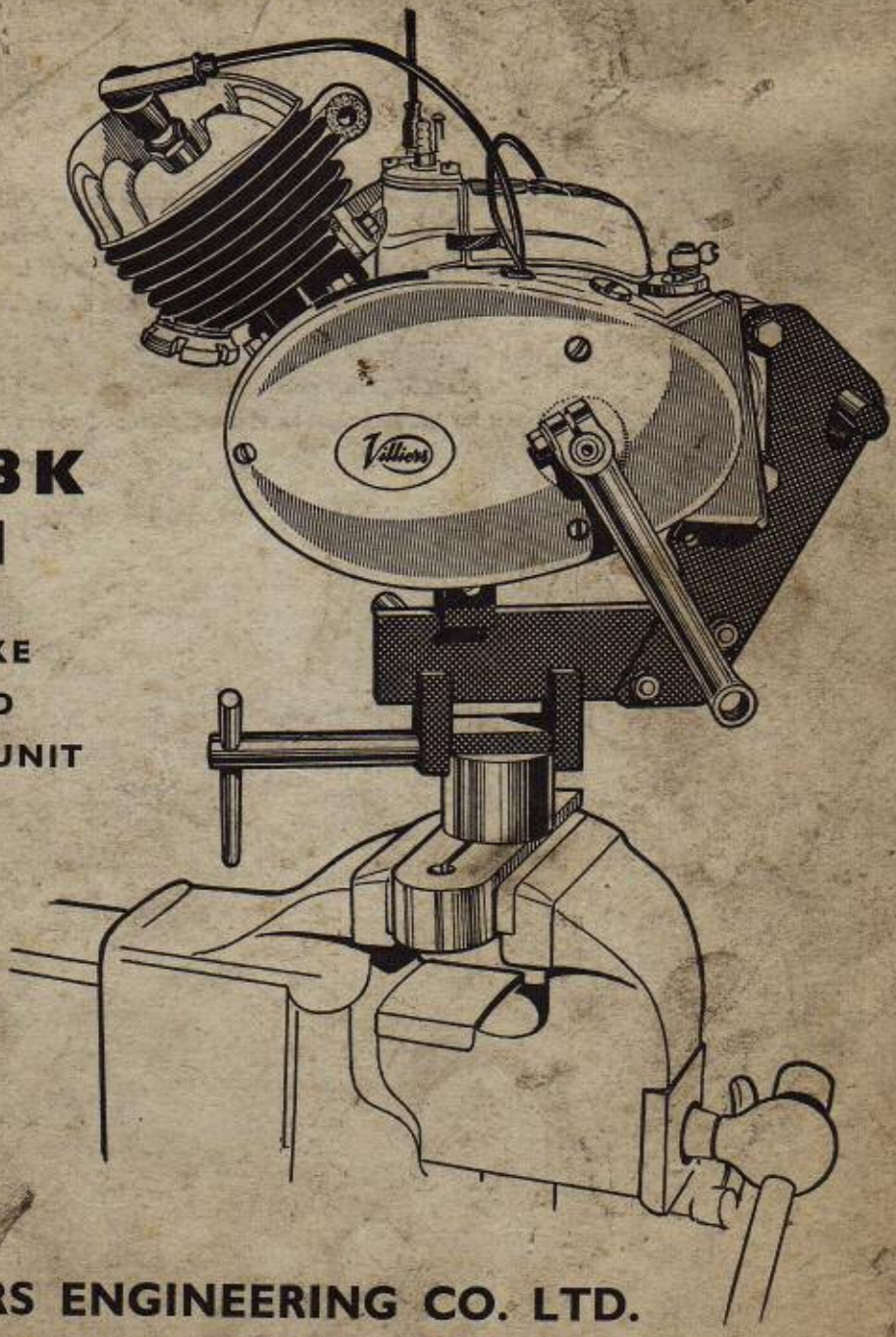
WORKSHOP MANUAL



MARK 3K & 3K/I

(50 c.c.)

TWO-STROKE
TWO-SPEED
ENGINE GEAR UNIT

3/6D
NET

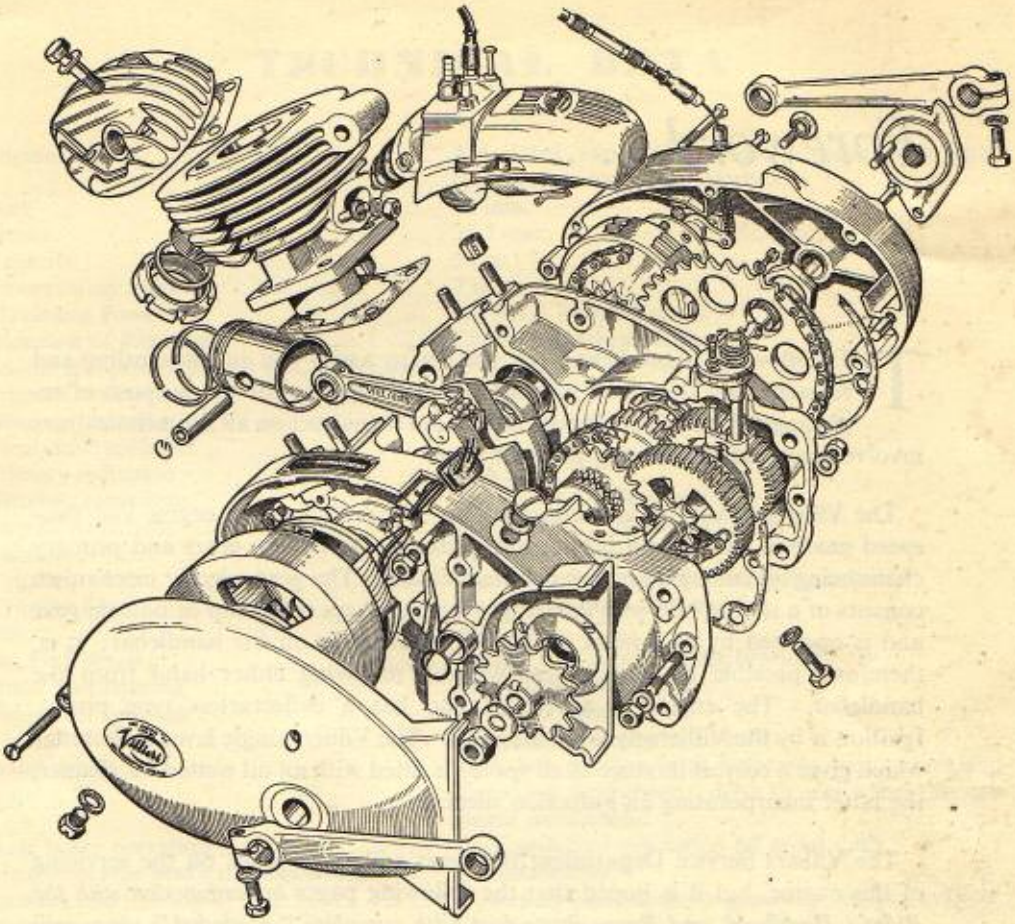
THE VILLIERS ENGINEERING CO. LTD.
WOLVERHAMPTON ENGLAND

VEC 156

SEPT. 1960

Later versions of Mark 3K have a new primary chainwheel (D.12261) and gear cluster (D.12262) neither being interchangeable with the earlier type. *Also* the clutch lever bush has been modified to allow a locking spring to be fitted to a new adjuster screw.

The Mark 3K/1 is similar to later versions of the Mark 3K except for left and right-hand crankcases and covers.



MARK 3K & 3K/1

50 c.c.

TWO-STROKE, TWO-SPEED

ENGINE GEAR UNIT

THE VILLIERS ENGINEERING CO. LTD.

MARSTON ROAD - WOLVERHAMPTON - ENGLAND

TELEPHONES: 22399 20 (lines) TELEGRAMS: "VILLIERS, WOLVERHAMPTON."

Foreword . . .

THE following pages have been written to assist you in dismantling and reassembling this small moped two-stroke engine for the purpose of replacing components. It does not set out to instruct on all the technicalities involved from an engineering point of view.

The Villiers Mark 3K unit consists of a 50 c.c. two-stroke engine and two-speed gearbox with a two friction-plate clutch, the clutch, gears and primary chain being all contained in one common casing. The gear selector mechanism consists of a sliding hub with face dogs which engages either top or bottom gear and is operated by a Bowden control to a twist-grip on the handlebar; it is, therefore, possible to change gear without removing either hand from the handlebar. The engine is air-cooled and has a deflectorless type piston. Ignition is by the Villiers flywheel magneto. The Villiers single lever carburetter which gives a correct mixture at all speeds is fitted with an oil wetted air cleaner, the latter incorporating an induction silencer.

The Villiers Service Department is always willing to assist on the servicing of this engine, but it is hoped that the following pages *in conjunction with the Rider's Handbook and Spare Parts List with complete "exploded" views* will prove of immense value to those wishing to give ordinary bench servicing.

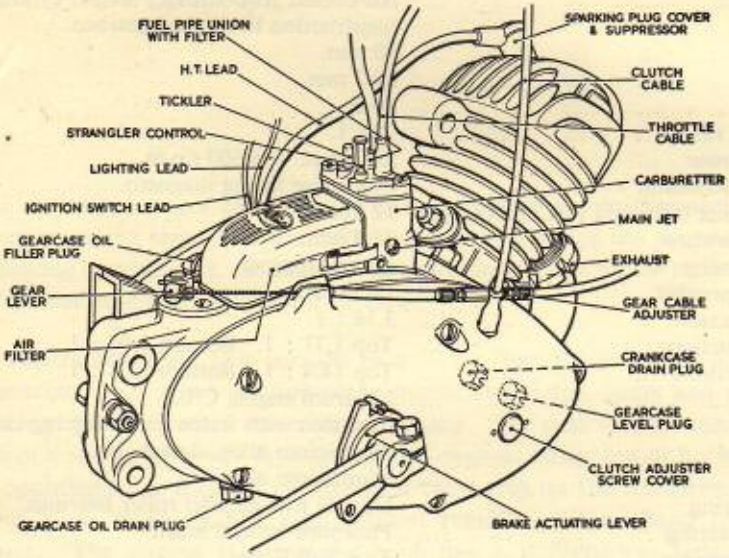
Routine maintenance and lubrication have been dealt with in the Rider's Handbook and is not repeated in these pages, but it should be remembered that the performance of the engine largely depends on the fit of the piston and rings in the cylinder bore, the disposition and area of ports, and the gas tightness of crankcase and cylinder head. To obtain maximum power it is, therefore, necessary to keep all ports free from excessive carbon deposits, and maintain good compression in the cylinder and in the crankcase by attention to all cylinder head and crankcase joints.

The information in this Manual covers engines manufactured prior to the publication date on front cover. Modifications to later engines will be embodied in subsequent editions.

TECHNICAL DATA

Engine unit	Air-cooled two-stroke, single cylinder with unit-construction two-speed gearbox.
Bore	40 mm.
Stroke	39.7 mm.
Capacity	50 cc.
Compression ratio	7 to 1.
Maximum Power	2.0 b.h.p. @ 5,500 r.p.m.
Direction of Rotation	Clockwise facing magneto.
Engine sprocket (attached to Clutch Cage)	12 Teeth.
Primary chainwheel	38 Teeth.
Gearbox capacity	$\frac{5}{8}$ pint. approx.
Final drive sprocket	12 Teeth.
Primary reduction	3.16 : 1.
Gearbox reductions	Top 1.71 : 1. Bottom 3.06 : 1.
Overall reductions	Top 14.4 : 1. Bottom 25.8 : 1.
Chainline	$2\frac{1}{2}''$ from engine C/L.
Cylinder	Cast iron with frame mounting lug cast on.
Cylinder head	Aluminium alloy, detachable.
Piston	Aluminium alloy.
Big End Bearing	Double row parallel roller bearings.
Small End Bearing	Phosphor-bronze bush.
Mainshaft Bearings	Two Ball Races.
Clutch	Two disc—running in oil bath.
Pedal drive	Built into gearbox, with automatic engagement and throw-out mechanism: drive to rear wheel through motor drive chain.
Rear brake operation	Back pedalling trip action off pedal shaft.
Maximum rear brake rod movement ...	1" horizontally.
Ignition and lighting	Villiers flywheel magneto-generator, output 6v. 18w.
Recommended bulbs	6v. 15w./15w. head. 6v. 3w. rear.
Carburetter	Villiers SM.10 with oil wetted gauze air cleaner.
Choke	Shutter type, integral with carburetter.
Exhaust system	Full length pipe and silencer, readily dismantled for cleaning.
Lubrication	Cylinder and crankcase by petroil mixture. Clutch, primary drive and gearbox by sump oil bath.
Sparking plug	Lodge BN.14 mm.
Exhaust pipe	1" O.D.
Plug gap	.018"/.022".
Ignition setting	$\frac{1}{32}''$ B.T.D.C.
Contact Breaker Points gap:	.012"/.015".
Overall length	$13\frac{1}{8}''$.
Overall height	$9\frac{5}{8}''$ approx.
Overall width	$9\frac{9}{16}''$.

Unified threads are used wherever possible.

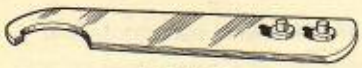


DISMANTLING

REMOVING ENGINE UNIT FROM THE MACHINE

After ensuring that the petrol tap is turned off remove the carburetter complete. This entails taking off the petrol pipe, the throttle control and unscrewing the two securing nuts on the cylinder. Note sequence of steel and fibre washers on studs, also paper and asbestos joint washers between carburetter and cylinder; these prevent heat from cylinder being transmitted to carburetter.

Clutch Nut and Exhaust Nut Spanner



S.T.2289

Unscrew ring nut with "C" spanner ST 2289 to release exhaust pipe.

Remove the split link in the drive chain, and take chain off the final drive sprocket.

Remove the split pin and washer from the rear brake mechanism to free the brake rod.

Disconnect the control cable from the gear actuating lever on engine. The clutch cable should be removed from the handlebar control and freed from any frame clips—the complete cable being removed with the power unit.

The lighting and ignition switch cables should be disconnected by pulling the nipples out of the P.V.C.-covered connectors, to be found about 6" from the crankcase grommet.

The cranks with pedals and brake ratchet mechanism should be removed before unscrewing the three nuts on the engine mounting bolts. Supporting the engine with the left-hand, push out these bolts. The engine may now be lifted from the frame and mounted into the servicing jig.

Note:

In all subsequent instructions it will be assumed that the 3K engine is held in the Villiers K/F Bench Jig ST.2307 as illustrated on front cover; all illustrations will show this jig being used.

TO REMOVE CYLINDER HEAD

Disconnect the H.T. lead and remove sparking plug.

With a box spanner loosen the four cylinder head nuts and remove them with their washers. The head can now be removed. If the joint is tight gentle prising with a screwdriver should suffice, but take care to avoid damaging either the head or the barrel. Do not use unnecessary force. Remember that a new gasket must be fitted here when reassembling.

Piston Heating Tool ST.2291

REMOVAL OF CYLINDER AND PISTON

Unscrew the four cylinder base nuts.

Draw the cylinder right off using a straight pull. Twisting the cylinder may result in the piston rings fouling the cylinder ports and breaking. Lift off the gasket *noting the way it was fitted.*

Remove both circlips which retain the gudgeon pin. Place the warmed piston heating tool (ST.2291) on the cleaned head of the piston and allow the piston to become heated. It should now be possible to push the gudgeon pin freely out of the piston and small end bush.

A hammer or mallet should not be used to remove the gudgeon pin.

Note: The Heating Tool need only be brought to boiling water temperature. If allowed to become overheated, the tool will distort.

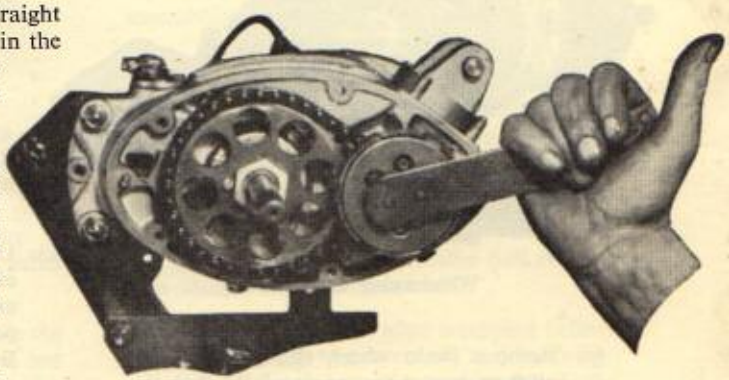
Connecting Rod Clamp ST.2302

REMOVAL OF CLUTCH

Drain the gearbox oil by unscrewing the drain plug at rear of engine. (The oil will run more freely if the filler plug also is unscrewed). The gearbox drain plug should not be confused with the *crankcase* drain plug or the gearbox level screw which are at the forward end of the underside of the crankcase.

The five countersunk screws in the right hand cover should be removed, and the cover detached together with the clutch cable. A rag should be placed underneath as oil may have been trapped between the cover and the right-hand crankcase. A rubber sealing ring will be seen between outer end of pedal shaft bush and cover—REPLACE IF WORN.

(a) Using the connecting rod clamp (ST.2302), which will prevent the crankshaft from turning, remove the lockscrew



Removing Clutch Locknut with ST.2289

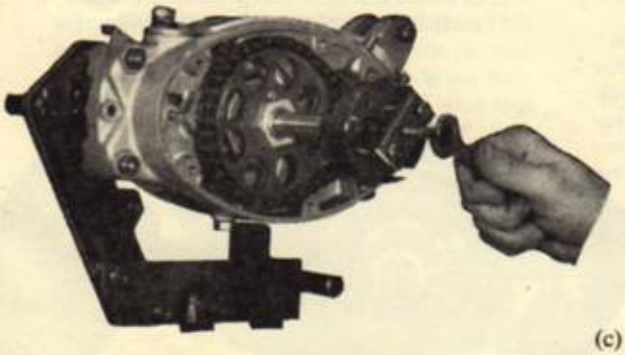
and washer from the chainwheel and unscrew the locknut.

(b) Push back with screwdriver the 6 turned up "*ears*" of the locking plate and totally remove 4 of the pins; the remaining 2 pins should then be unscrewed evenly. The lock-plate, the pressure plate and the clutch springs will now be free. The spring cups may be prised out of their sockets with the point of a screwdriver.

(c) Remove the clutch hub nut by means of the pegged end of "C" spanner (ST.2289). A hammer may be used if the nut is particularly tight. *Under no circumstances must the magneto flywheel be clamped in order to remove this nut.* The clutch plates may now be withdrawn. Note carefully the sequence of the plates; the thick plate outside followed by two friction plates separated by a thin plate and finally a plate having six pillars for the spring cups. The thick outer plate has chamfered holes in which the cups rest.

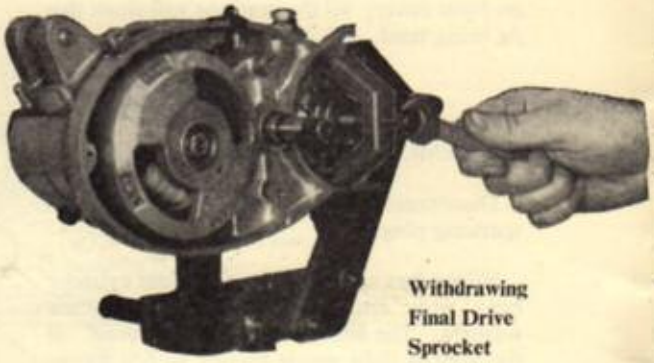
Clutch Hub Extractor ST.2301

(d) Using the clutch hub extractor (ST.2301) withdraw the hub from the taper of the crankshaft.



Withdrawing Clutch Hub

(e) Remove chain wheel, chain and clutch cage as a unit noting carefully that the shims, which may have been required for correct chain alignment, do not come off with the chain wheel and fall on the floor. Remove the distance piece.



Withdrawing Final Drive Sprocket

REMOVING THE FINAL DRIVE SPROCKET AND THE FLYWHEEL MAGNETO

(a) Take out the three countersuck screws and remove left-hand (magneto) cover. Holding the final drive sprocket with the chain tool, supplied with the jig, unscrew the sprocket lock nut having first bent back the ear of the lock washer. Remove the washer and using the sprocket extractor ST.2285 draw the sprocket off the tapered shaft and remove key.

(b) Unscrew the flywheel lock-nut holding the flywheel steady by means of a strap wrench placed around the rim of the flywheel. The use of the strap wrench is essential if the connecting rod clamp is not fitted. Note that there is no washer behind this nut.

Sprocket Extractor ST.2285

(c) Unscrew the centre bolt of the flywheel extractor (ST.2290) well back and screw extractor into the flywheel as far as possible, lightly tightening with a spanner. By screwing in the centre bolt of the extractor the flywheel is drawn off the shaft (see illustration).

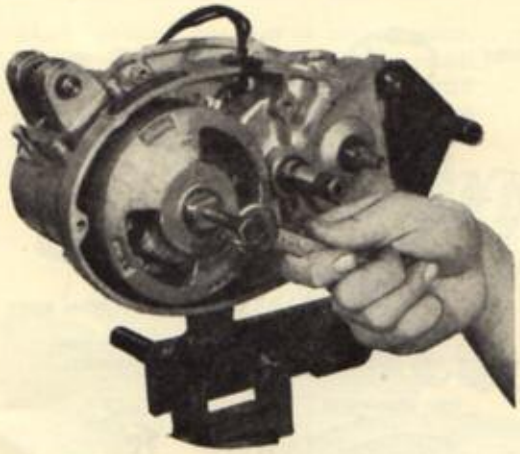
Flywheel Extractor ST.2290

(d) Remove the woodruff key which may have remained in its slot on the crankshaft.

(e) Place the flywheel with its open side downwards on a clean piece of paper *ensuring that no iron filings or metallic dust are attracted to it;* subsequent removal of such foreign matter is unnecessary trouble. If the timing does not need altering the stator plate and crankcase can be marked so that the plate can be re-fitted in the same position.

(f) Take out the screw (and nut in carburetter recess where fitted) from the lead clip.

(g) Remove the two retaining screws and nut from the stator plate and withdraw the



Drawing Flywheel off Shaft

plate off the crankshaft, sliding the grommet out of its slot in the crankcase at the same time, to avoid unnecessary strain on the cables. The stator plate must always be handled with care to avoid damaging the windings and other delicate parts.

It is assumed that the unit is mounted in the bench jig with the pedal cranks removed, but it is also possible to remove the magneto with the engine in the machine.

TO SPLIT THE CRANKCASE

Remove the connecting rod clamp tool, unscrew the five nuts and washers on the left-hand side of the crankcase and the three on the right-hand side. Tap out the three studs from the left-hand side of the case; the forward one acts as a dowel and must be a good fit. Similarly remove the small dowel stud at rear of crankcase. With a pointed tool release the

Tapping out Shafts

gear operating lever spring by unhooking it from the lever. Remove the two screws and lift off the gear selector unit and paper washer *noting the position of screws.*

The unit should now be removed from the jig and immersed in boiling water to free the ball races from their housings.

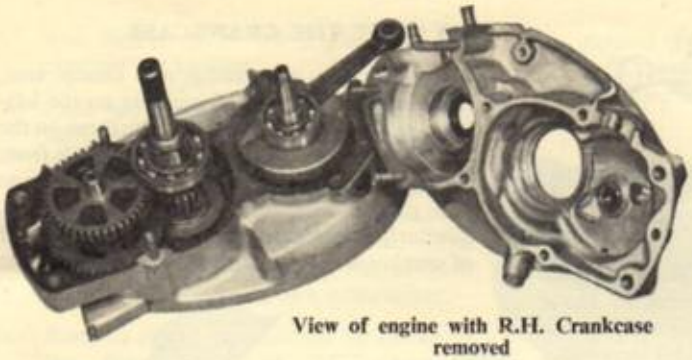
When warmed, hold the right-hand case, upwards, over wooden surface or similar material to avoid damage, and tap both shafts lightly in turn with a hide mallet until the bottom half with shaft and gear assemblies drop out.

A paper washer is fitted between the two halves and a new one will be required when assembling.

Lift gear cluster with bearing off pedal shaft and the high gear wheel from countershaft noting that *the narrow openings of dog engagement slots must face inwards* to form a positive driving edge when selector hub is in high gear. Lift off gear selector hub—this can be replaced either way round.

Tap the driveshaft out of other half crankcase whilst case is still hot.

Remove countershaft after wrapping Sellotape over keyway to protect oil seal lip from sharp cutting edges. Remove pedal shaft complete with low gear wheel and pedal chain.



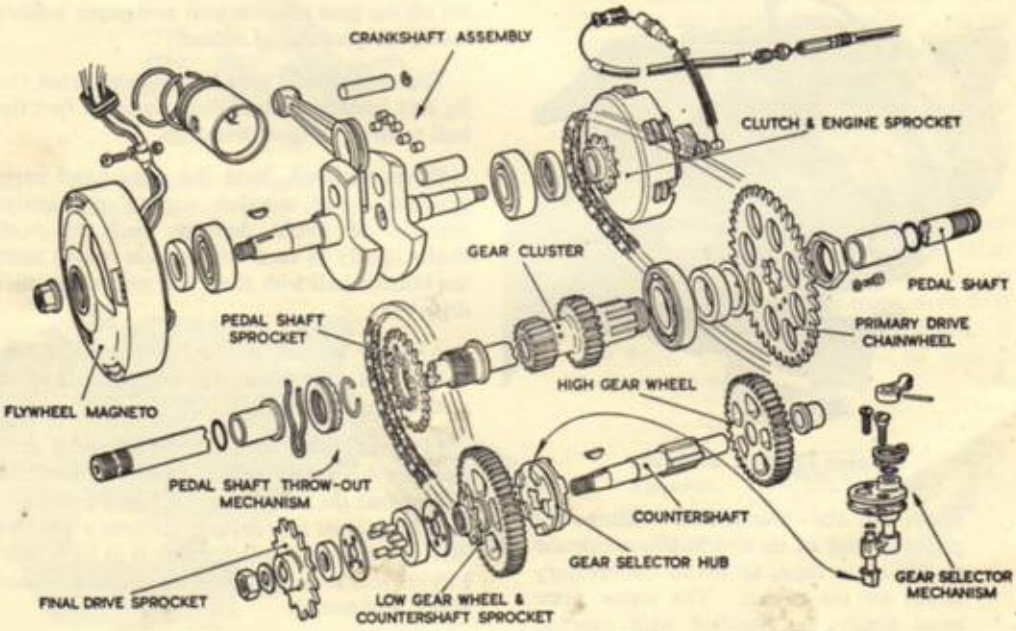
View of engine with R.H. Crankcase removed

All components can now be inspected. Note that a new chain or new low gear wheel can be fitted without disturbing the circlip which retains the sprocket on the pedal shaft.

The separation of the crankshaft halves should not be attempted in the normal workshop, as the assembly of them is a specialised factory operation. However, a crankpin extractor is available for those who have the necessary facilities. (ST.2311).

Watch for loose rollers dropping out of final drive bearing. A piece of cloth spread underneath will collect these. The roller bearing consists of an outer race with a steel washer underneath, twelve rollers and a similar washer above.

If a new crankpin is being fitted to an old crankshaft, then the crankpin and connecting rod must be .001" oversize. New standard size crankpins must only be fitted to new driveshafts.



Crankshaft, Pedal Shaft, Countershaft and Components

RE-ASSEMBLY

Before assembling, clean all engine parts with paraffin and dry off with clean rag. Remove traces of jointing compound from all mating surfaces, but take great care that no metal is removed by harsh treatment with screwdriver or other metal scrapers which may score or damage the seal. This is particularly important where the two parts of the crankcase join as the functioning of a two-stroke engine depends upon an airtight crankcase.

Have new paper washers and gaskets ready. Use Wellseal or Seccotine to hold washers in place whilst assembling. There is no washer on magneto side outer cover, but use Wellseal on rear portion only to prevent possibility of water getting into magneto via rear chain compartment. Check condition of rubber oil seals—if worn or perished, fit new ones, (spring groove facing inwards). Use Oil Seal Tools ST.2312, ST.2313.

Heat left-hand side case in boiling water. Blow all water from oil seals. Fit driveshaft with large tapered end downwards. A small piece of Sellotape stuck on threaded and tapered end of shaft will prevent possible damage to oil seal.

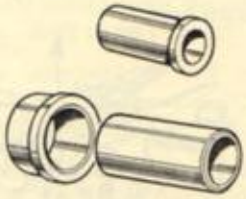
Inserting Crankcase Oil Seal using ST.2312

The ball bearing should be pressed right home whilst the case is warm, allowing to cool whilst preparing the other parts.

All parts must be smeared with oil before fitting and the half-case should be supported on a tray or box whilst assembling.

Place ratchet sleeve with drag spring fitted in groove into left-hand case, the loop of the spring resting between the two portions cast underneath the pedal shaft bush, ratchet teeth facing outwards.

Oil Seal Insertion Tools ST.2212 ST.2213



Insert roller bearings with thrust washer on top. With pedal shaft, sprocket chain and low gear wheel assembled lower assembly into crankcase bush through the ratchet sleeve. Slight movement rotationally of the pedal shaft will allow the ratchet sleeve to engage the worm on the pedal shaft which will then drop home.

Check through hole in sprocket that drag spring loop is still between the two portions cast in case.

Place a small piece of Sellotape across the keyway of the countershaft on the taper only to prevent possible damage to the oil seal. Insert countershaft through low gear wheel and into roller bearing.

Place gear selector hub on splines, followed by the high gear wheel, narrow slots downwards. Place gear-cluster over pedal shaft.

Now heat the right-hand crankcase as described previously.

Fit new paper gasket in position on lower case with Wellseal and lower the hot case over the shafts and ball bearings, taking care not to damage oil seal on drive shaft.

Quickly replace the studs, washers and nuts, holding the cases together and tighten all nuts.

Give a *light* tap (with hide mallet) to each end of the shafts to relieve any side load on the bearings, when all parts should revolve freely.

The unit should now be placed in the bench jig for further assembly.

Place gear-change bracket joint washer in position and fit the bracket, ensuring that the slider engages in the groove of the gear selector hub.

Replacing spring on Gear Change Lever

Tighten the two screws in their correct positions, long screw on the left-hand, first passing through the loop end of the spring. At th s stage check the gear and neutral select on for engagements and freedom of the spind e. Now, with a pointed tool, lever the spring in position to locate on gear operating arm, bringing the slider into the high gear posi on.

ASSEMBLING CLUTCH AND PRIMARY DRIVE

(a) Place distance piece over splines on pedal shaft and steel shims, if any, to line up clutch sprocket and chainwheel.

(b) Fit clamp tool on connecting rod and smear the *parallel* surface of drive shaft with a graphited grease. *Not on taper.*

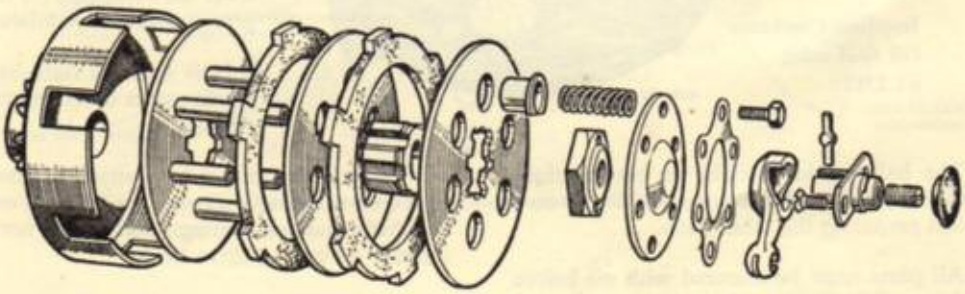
(c) Place endless primary chain around chainwheel and clutch sprocket then fit both chainwheel and clutch cage on to shafts. Place splined hub on to clean and dry tapered drive shaft. Fit clutch plate having six pillars over splines of hub, followed by one of the friction plates, then the thin steel plate and the second friction plate, finally the thick top plate, chamfered holes outwards.

(d) With the peg spanner screw on the securing nut, flat side inwards, taking care not to overtighten or damage will occur. Torque 12—18 ft. lbs.

The nut sides must be aligned to allow the flat side of spring cups to fit when bolts are fully tightened.

(e) After placing the cups and springs in position fit the pressure plate first, then the locking plate. Screw in the small bolts *evenly* till each is up solid, using a box spanner. Turn up locking plate to engage a flat on bolt heads so preventing bolts from unscrewing.

Replace and tighten nut securing chainwheel and lock with small screw and washer.



Clutch Assembly

FITTING MAGNETO

Turn the engine round and fit the stator plate, lining up the two marks previously made, (see Removing the Magneto). It will be found advantageous to slide the rubber grommet into its slot at the same time as the stator is re-fitted. Leave the two screws and nut finger tight for final timing, if re-timing is necessary. Replace screw in lead clip and lock with nut, if fitted. Replace Woodruff key in shaft. Wipe taper of shaft and flywheel quite clean before assembly. Make certain that no foreign matter is adhering to the flywheel poles and that the wheel is perfectly clean. Replace flywheel, making sure that the key remains in its correct position engaging in keyway and tighten the flywheel locknut to 320 lb. inches—note that this nut has no washer. A strap wrench must be used to hold the flywheel if the connecting rod clamp is not fitted.

RE-FITTING CYLINDER AND PISTON

Remove connecting rod clamp and fit new paper cylinder base washer carefully noting that as the studs are widest on the magneto side the paper washer will only fit one way.

Before fitting the cylinder, the bore should have been checked for wear by means of a dial gauge. If wear is shown to exceed .008″ the cylinder should be rebored to the next oversize, and an oversize piston with rings fitted. Even if the wear is not serious, but there are scores or scratches reboring will be necessary. The piston should also be checked for wear. Pistons are available in the following sizes:—

(1) Standard diameter (1.572″).

(2) .015″ oversize.

(3) .030″ oversize.

Before rings are replaced on piston they should be checked for wear by inserting each ring into the least worn part of the cylinder barrel, *i.e.* at the bottom, and the gap checked with a feeler gauge. Take care that the ring lies square in the bore to obtain a correct reading.

If gap measures .025″ or more, fit new rings giving a gap of .006″ to .010″.

The expander ring fitted beneath the lower piston ring should be renewed as constant heating causes it to loose a certain amount of tension.

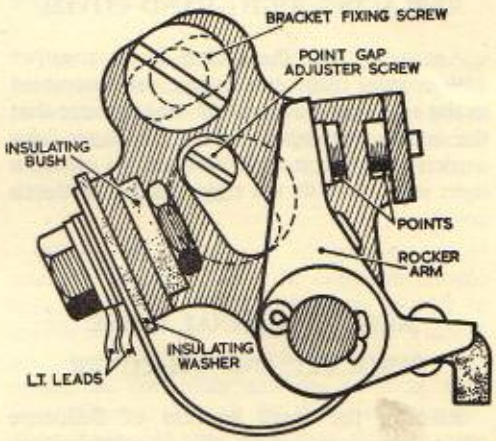
Fit one circlip and heat piston before placing over connecting rod, ensuring that it is in the correct position as originally fitted, *i.e.* with pegs to rear of cylinder. Smear gudgeon pin with engine oil before fitting into piston and then pass it through the connecting rod small end bush until it butts against the other circlip in the piston. Refit second circlip.

Circlips bent or damaged in any way should be discarded and new ones fitted. Ensure that circlips fit snugly into grooves.

Smear cylinder bore and piston surfaces with engine oil and fit cylinder barrel over piston taking every care not to twist the cylinder which would cause the ring ends to foul ports.

Ensure each piston ring is fully compressed in its groove as the barrel passes over it. Replace cylinder holding nuts, screwing each in turn until all are fully tight.

CONTACT BREAKER ADJUSTMENT AND RE-TIMING THE IGNITION



Turn flywheel until piston is at top of its stroke (T.D.C.) and just slacken the bracket fixing screw. Adjust the eccentric screw until a .015″ feeler blade can be inserted between

the points. With the gauge nipped by the points retighten the clamping screw and withdraw the gauge. Recheck that the gap is between .012″ and .015″.

Turn flywheel anti-clockwise (backwards) until piston has moved down $\frac{3}{32}$″ below top of stroke ($\frac{3}{32}$″ Before Top Dead Centre). Gaining access through the flywheel slots twist the stator plate, anti-clockwise to advance, clockwise to retard, until contact breaker points are just beginning to open then tighten the two clamping screws and the pillar nut. Recheck point gap, timing, and tightness of screws.

REPLACING CYLINDER HEAD

A gasket is fitted between cylinder head and barrel; these joint faces must be perfectly clean and flat, and free from scratches or bruises. Place head in position, the sparking plug being at the left side. Each cylinder head bolt should have a thick plain steel washer under its head. Screw down each bolt finger tight; finally screw down half a turn at a time until all are fully tight. Clean and re-adjust spark plug points if necessary and replace. Replace high tension lead.

REPLACING RIGHT-HAND COVER

Assuming that the clutch lever, together with control cable and spring, are assembled in the right-hand cover, and making sure that the mating surfaces are clean, fit paper joint washer in position with Wellseal, to ensure a tight joint, and fit the right-hand side clutch cover.

REPLACING FINAL DRIVE SPROCKET AND L/H COVER

Remove the small portion of Sellotape previously wrapped on the countershaft to protect the oil seal from damage by the keyway. Fit the woodruff key and the final drive sprocket, making quite certain that the key engages in the keyway of the sprocket. The service tool for holding the sprocket should now be used. Replace locking washer, locating tang in the slot cut in the sprocket, tighten nut and then turn over a section of the washer to lock on a flat of the nut.

Replace large " O " ring over pedal shaft bush. Insert the small " O " ring into the pedal shaft housing in the cover. Carefully work cover over the shaft having first put Wellseal over the joint faces; there is no gasket with this face, but it is advisable to use Wellseal to prevent water penetrating into the cover and interfering with the functioning of the magneto.

COMPLETING RE-ASSEMBLY ADJUSTING CLUTCH AND INSTALLING IN MACHINE

After cylinder head has been bolted into position the carburetter with air filter should be fitted, care being taken to place heat insulating joint and stud washers in their correct positions.

The engine is now ready for installation into the machine, reversing the procedure given on page 4. Note pedal cranks are marked L and R to ensure correct fitting.

The gearbox should be filled with oil, but first of all ensure that the drain plug has been screwed up tight. Pour in oil until it begins to drip from the level plug orifice. Replace filler and level plugs. See illus. on page 4.

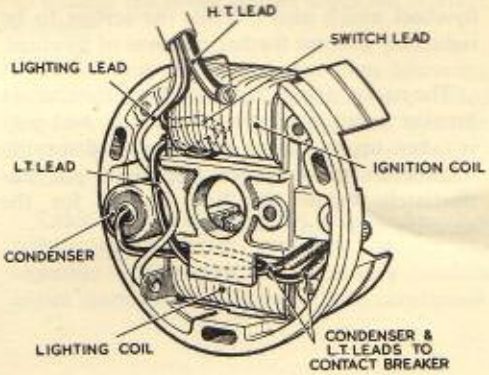
The clutch and gear operating cables should now be attached. Dealing with the clutch first of all, after attaching slacken the cable to release any tension and proceed to adjust the clutch itself by first removing the rubber plug and exposing the clutch adjusting screw.

Turn adjusting screw to the right (the amount of movement necessary is small once the critical point has been reached) so that when moderate pressure is applied to one pedal the pedal shaft will rotate without turning the engine. From this point of adjustment rotate the screw anti-clockwise, $\frac{1}{4}$ to $\frac{1}{2}$ a turn. Replace sealing plug.

The clutch cable must be adjusted to allow $\frac{1}{16}$″ to $\frac{3}{16}$″ free movement of the lever when the engine is installed in the machine.

A very small amount of slack should also be allowed in the gear operating cable, thus ensuring that the sliding hub engages completely with the low gear wheel.

The throttle cable should be adjusted to allow the engine to " tick over " in the fully closed position and in the other position to fully open the throttle. The lighting and switch cables must now be re-connected.



IGNITION FAULTS AND MAGNETO SERVICING

If a good spark is being obtained at the sparking plug no servicing is necessary, but if engine continues to misfire after fitting a new sparking plug and after the contact breaker gap has been checked then a more detailed examination is necessary. See page 11 for contact breaker adjustment.

Should the contact breaker points be badly pitted the condenser or associated connection may be at fault. Clean and tighten connections or replace condenser as necessary.

However, should a poor spark still be obtained at the plug points then it will be advisable to try a new ignition coil, but first of all ensure that the H.T. lead is in good condition and is properly connected by a screw to the H.T. coil.

If a new coil is fitted it may be necessary to use the later type cheese headed screws, with shakeproof washers instead of countersunk screws.

Failure of the magneto can sometimes be traced to bad contact of the older pattern countersunk screws. The cure is to clean both countersink and screws.

It will be necessary to remove the flywheel but not the stator plate from the engine if it is required to change either of the coils. The condenser may be more readily replaced with the stator plate removed.

Before removing any leads make a note of their position so that they can be threaded back in the same position.

Periodically, contact breaker components will have to be replaced. This is a straightforward process, but care must be taken when fitting the rocker arm to avoid distorting the leaf spring, by excessive bending.

* * *

REPLACING IGNITION COIL

The H.T. coil can be released by removing two screws, one at each end of the coil core, and the three leads.

The H.T. lead is easily disconnected by removing the screw, but the L.T. leads should be removed by melting the solder at the point where they are attached to the coil. Take care that the soldered connection of the primary wire is not disturbed.

When fitting a new coil or replacing an old one, the screws through the coil ends should first of all be replaced sufficiently loosely to enable the coil unit to be adjusted. Tighten up the flywheel and check the clearance between the coil ends and the magnets with feeler gauges, through the flywheel openings. This gap should not be less than .015″ or more than .020″. Failure to carry out this operation may result in serious damage to both coil end and to flywheel by scoring, or overheating due to friction resulting from rubbing. Access to the coil is obtained through the slots in the

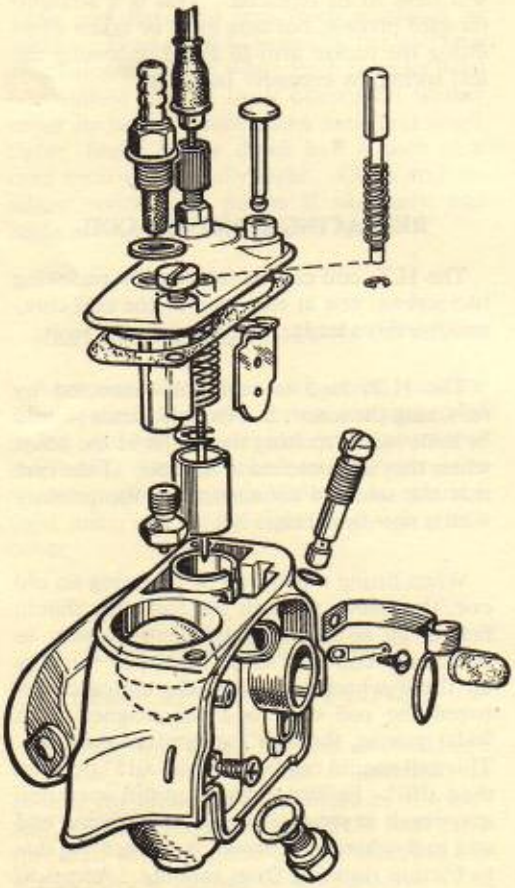
flywheel which also enables the screws to be tightened without further removal of flywheel.

The rocker arm is insulated from the contact breaker point bracket and excessive end play is taken up by means of washers of varying thicknesses placed over the pivot pin immediately below the hole drilled for the securing split pin.

* * *

CARBURETTER

Fuel enters the float chamber through a gauze in the petrol union on the top cover. It then passes through a passage in the base of the body to the main jet, which is screwed into the right-hand side of the body, through the taper needle jet where it is mixed with the incoming air to give a combustible mixture. All air entering the carburetter is cleaned by an oil wetted filter combining an induction silencer.



S.M.10 Carburetter

The correct petrol level is maintained in the chamber by the action of the spherical float, which, rising with the incoming petrol shuts off the fuel supply by pressing against a needle valve screwed into a projection on the underside of the cover. No maintenance is necessary beyond normal flushing out to ensure that no fine deposits of foreign matter have entered the main jet or have affected the action of the fuel needle.

The top cover is removed by extracting two screws. Attached to the cover is the throttle, taper needle, and the choke; the throttle being held by the nipple at the end of the control cable. To release the throttle push it up against the top cover, against the spring, and allow the nipple of the cable to come out of engagement into the releasing slot. The taper needle is suspended from and moves with the throttle, being held therein by a slotted (horse-shoe) plate which engages one of the five slots, the actual position being chosen to suit particular engines and the conditions under which the engine operates. Fine adjustment may be made to the setting of the taper needle by reversing the plate which is dished. The plate itself is now retained on the taper needle by a circlip.

The throttle slide can only fit in one position, this being governed by a slot which engages a key in the body.

The strangler plate slides into a slot in the body and is located by a spring clip, the plate being operated by a spindle which projects from the top cover. Press downwards to give a rich mixture for starting. The spring clip is secured to the body with a screw, access to which is possible by removal of the oval rubber air seal.

Proportionately with the opening of the throttle so the strangler plate is lifted by means of a projecting tang which fits into a slot at the top of the throttle slide.

A gasket seals the float chamber, a vent being drilled from the air intake side into the chamber. A hollow plug is screwed into the base of the body immediately below the taper needle jet and this should be removed occasionally so that any deposits which have entered with the fuel may be cleaned out.

The main jet is easily removed without dismantling the carburetter and any foreign matter in the jet can be blown out. Never clean any of the jets with wire as this will tend to enlarge the holes and so affect the mixture strength.

To prevent the carburetter from becoming overheated, insulation washers are fitted between the carburetter flange and cylinder in addition to which both studs also carry insulation washers.

Later pattern carburetters are fitted with a tickler which, when depressed, floods the chamber with petroil, thus assisting towards easier starting under extreme cold conditions.

SERVICE TOOLS

Part No.	*Description*
ST.2285D	Sprocket extractor.
ST.2289D	Clutch nut and exhaust nut spanner.
ST.2290D	Flywheel extractor.
ST.2291D	Piston heating tool.
ST.2301D	Clutch hub extractor.
ST.2302D	Connecting rod clamp.
ST.2312D	Oil seal insertion tool.
ST.2313D	Oil seal insertion tool.

VILLIERS SERVICE EXCHANGE SCHEME

To facilitate speedy and more economical servicing of this unit, the following are available for service exchange from the machine manufacturers (or their official agents) or from Villiers Service Department:—

Engine complete.

Magneto complete.

Carburetter (less air filter).

Rebored cylinder with oversize piston, rings and gudgeon pin. (The cylinder presented for exchange must be suitable for reboring to our maximum oversize of .030").

Driveshaft assembly.

PRINTED IN ENGLAND BY CRADLEY PRINTING CO. LTD., CRADLEY HEATH AND LONDON