For technical specifications, updated information about oils, tips and frequently asked questions please visit:
www.ajsmotorcycles .co.uk

To view the parts book and order spare parts please visit:
www.ajs-shop.co.uk

AJS stormer workshop manual

For:

250

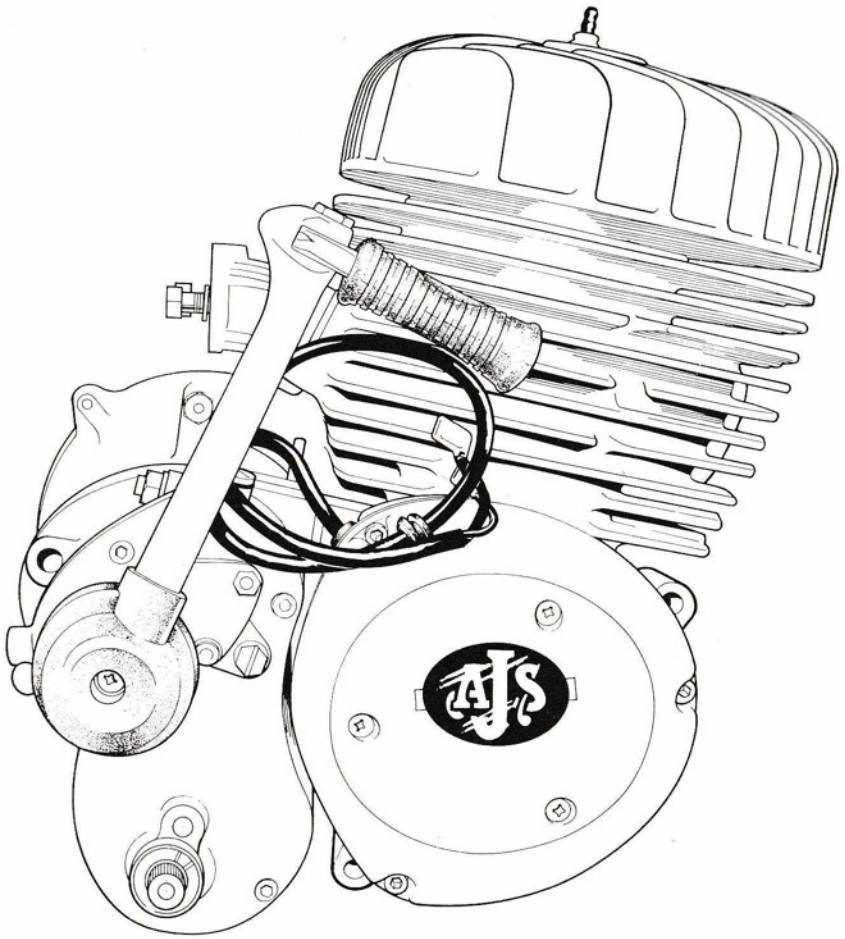
370

410

AJS Stormer spare parts are available online form the AJS Web Shop

Many Stormer parts are New Old Stock, some are reproduced to the original drawings.
The Stormer Parts book has been reproduced in the web shop and so it should be easy to find what you are looking for.
We ship world wide. Orders are usually dispatched within one working day.

INDEX



General View of Engine

INTRODUCTION

FOREWORD

This manual is intended for use both by workshop personnel and enthusiastic owners. It provides full descriptions, comprehensive step by step dismantling and reassembly procedures and detailed inspection information supplemented by illustrations. Use of this manual should enable an operator to carry out basic maintenance and overhaul work on the AJS Stormer series.

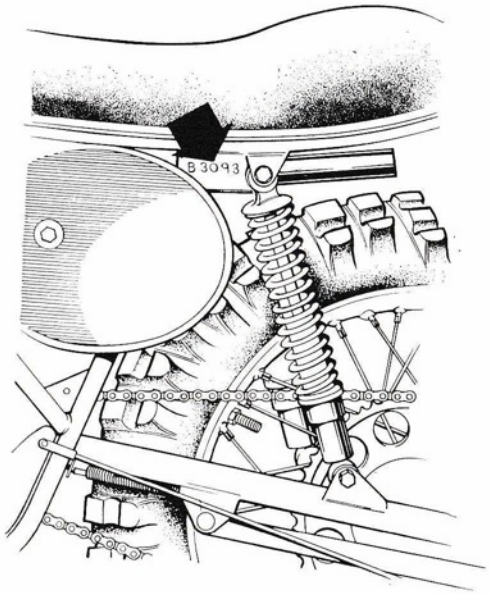
DESCRIPTION

The Stormer engine/gearbox unit is of the semi-unit construction type, the gearbox forming a bolted-up assembly with the crankcase but being seperable as a complete unit.

ENGINE AND FRAME NUMBERS

Whenever replacement parts are ordered or technical advice is sought, it is most important for the engine and frame serial numbers to be quoted. The location of these numbers is shown below.

In every case where these numbers are quoted, please ensure that any prefix or suffix numbers are quoted to aid type identification.



Frame number location.

The engine

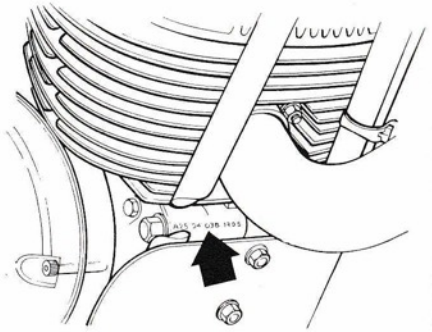
A single cylinder air cooled two stroke unit with piston controlled breathing. The crankcases, cylinder and cylinder head are of light aluminium alloy, the cylinder having a pressed in spun-cast iron liner. The Stormer engine has been produced in 250 cc, 370 cc and 410 cc (15, 22 and 25 cu. in.) engine capacities, each developed specifically to provide a high power output throughout a wide rpm range with outstanding torque characteristics and flexibility. The crankshaft is a built-up assembly comprising two crankcheeks and shafts with a pressed in and plugged crankpin. The connecting rod is a steel forging with a caged needle roller big end bearing and steel backed phosphor bronze small end bush. The crankshaft is supported by single lip caged roller bearings and outrigger needle roller bearings. The piston is of cast alloy with two cast iron piston rings located to pegs in the piston body.

Gearbox

A four speed positive stop gearbox is used. Alternative close or wide ratio gear clusters are available. The pinions are of high grade alloy case hardened steel to provide adequate strength for cross country purposes. Gear selection is through a ratchet and pawl positive stop mechanism to a rotating cam barrel which aligns the selector forks for the various gear positions. A spring loaded cam barrel index plunger is provided.

The clutch

An all-metal multi-plate diaphragm spring type operated by a helix-type clutch pull rod mechanism with adjuster mounted in the outer chaincase. This clutch is a most robust unit which will give trouble-free service over a long period if kept in correct adjustment. The clutch has sintered bronze faced friction plates and pressed steel intermediate plates. A steel pressure plate carries the thrust of the diaphragm spring which is retained in the housing by a single, large circlip.



Engine number location.

Electrical system

An energy transfer electrical system is fitted, comprising an alternating current (AC) flywheel generator and an external ignition coil.

The flywheel is of light alloy with cast-in steel pole pieces, two magnetic segments of Alcomax (that is, four poles) and one compensating weight of brass.

The stator is a steel lamination in "spider" formation with twin energising coils mounted on alternate arms of the laminations. The coils are connected externally. See *Fig. 10.*

A condenser of 0·3 UF rating to match the ignition coil design is mounted on the contact breaker points base plate. Conventional contact points with a coil type rocker spring are used.

How the system works

AC electrical current is generated by the passage of the flywheel magnetic poles over the energising coils. The current accumulated by the energising coils in series supplies the primary windings of the external ignition coils, causing heavy current to flow. The relationship of the stator energising coils to the fly-wheel provides that the contact breaker points open when the maximum current is flowing in the energising coils. As the points open there is a sharp collapse of the magnetic field in the ignition coil core, voltage being fed to the condenser to accelerate the rate of collapse of the magnetic field and subsequent resonance of current. At the moment of collapse of the magnetic field, very high voltage is generated in the secondary windings causing a discharge through the high tension (HT) lead to cause the spark at the spark plug points.

Frame

The frame is of registered design, constructed with a large diameter tubular backbone supporting the steering head, twin downtubes anchoring the engine cradle. This frame provides exceptional torsional rigidity, combining lightness with strength.

The swinging arm pivot is designed to allow for rear chain tension adjustment, the pivot bolt being eccentric to the side plates. The swinging arm pivots between the two parts of the composite nylon/steel bushes. The rear suspension units are combined spring and oil damper units mounted top and bottom on rubber/steel bonded bushes.

The front forks

The oil damped telescopic variety with internal springs and provide 6¼ in. (158·8 mm) of travel. Aluminum alloy lower fork legs with heavy duty bushes top and bottom, slide on tough chrome molybdenum steel main tubes. Aluminium alloy top and bottom yokes with a removable steel stem support the fork leg assemblies. The steering head bearings are of the pre-packed and sealed variety mounted in the frame.

Wheels and Brakes

Lightweight conical hubs with cast-in iron liners and steel hub tubes incorporate pre-greased and sealed-for-life ball journal bearings. Currently, high tensile light alloy wheel rims with double security bolts front and rear are used. Previously, either bright chromed or high tensile steel rims have been used. The rims are laced to the hubs with forty spokes front and rear for all types. The brake assemblies are conventional internal expanding type of the single leading shoe variety. The ingress of dirt and foreign matter into the hubs is minimised by the use of the unique AJS piston ring seals fitted in grooves in the brake plates.

The fuel tank

A tough glass reinforced plastic (GRP) unit with a single lever type fuel cock which does not provide a reserve.

Carburetor

An Amal concentric float instrument is used on all capacities; the type 900 instrument on 250 cc (15 cu. in.) models and the type 1000 on 370 cc (22 cu. in.) and 410 cc (25 cu. in.) models.

Air filter

A large capacity airbox is mounted neatly behind the left side number plate. The air hose connects to the back of the airbox and a removable element is used. Two alternative types of filter element are recommended to suit varying markets and conditions.

The exhaust system

An upswept exhaust pipe cum expansion chamber of similar design for the various capacities but developed individually to provide the desired characteristics for each. The exhaust system is mounted over the cylinder head and between the frame tubes below the front of the seat to avoid damage in use. A perforated leg shield is secured to the expansion chamber. The expansion chamber of the 410 incorporates a muffler.

TECHNICAL DATA

		Y4	Y4 Mk. 2	Y40	Y41	Y5	Y50	Y51
Bore	mm	68	68	68	68	83	83	83
	in.	2·676	2·676	2·676	2·676	3·26771	3·26771	3·26771
Stroke	mm	68	68	68	68	68	68	74
	in.	2·676	2·676	2·676	2·676	2·676	2·676	2·92
Capacity	cc	247	247	247	247	368	368	400
	in.	15·07	15·07	15·07	15·07	22	22	24·24
Compression Ratio		11:1	11:1	11:1	11:1	11:1	11:1	11:1

PORT TIMINGS

Exhaust	180°	180°	180°	180°	180°	180°	180°
Transfer	135°	135°	135°	135°	130°	130°	130°
Inlet	152°	152°	152°	152°	170°	170°	154°

IGNITION TIMING

At Piston (in./mm)	·100/2·5	·100/2·5	·100/2·5	·100/2·5	·100/2·5	·100/2·5	·125/3·2
At Crankshaft (Degrees)	20–22	20–22	20–22	20–22	20–22	20–22	20–22
Contact Breaker Points Gap			·015 in. (·38 mm)				

SPARK PLUG

Type	Champion N3, N3G
Gap	·025 in. (·635 mm)

TRANSMISSION

Engine Sprocket	20	20	20	20T	24T	24T	24T
Clutch Chainwheel	43	43	43	43T	40T	40T	40T
Countershaft (Gearbox) Sprocket	13	13	13	13T	12T	12T	13T
Rear Wheel Sprocket	61	61	57	59T	65T	61T	59T

GEAR RATIOS

Type	Close	Close	Wide	Close or wide to order	Wide	Wide	Close or wide to order
Reductions, wide ratio		1 —	1·25 —	1·66 —	2·52		
Reductions, close ratio		1 —	1·25 —	1·51 —	2·00		
Chain size (primary)				⅜ in. × ¼ in. Duplex			
Chain size (rear)				⅜ in. × ¼ in.			

CARBURETOR

	Y4	Y4 Mk. 2	Y40	Y41	Y5	Y50	Y51
Type	932	932	932	932	1034	1034	1034
Choke (mm)	32	32	32	32	34	34	34
Main Jet	280	280	280	280	360	360	290
Pilot Jet	20	20	20	20	25	25	25 No Cross Hole
Needle Jet	107	107	107	107	107	107	107
Needle Position	Middle	Middle	Middle	Middle	Middle	Middle	Bottom Groove
Throttle Valve	3	3	3	3	2½	2½	2½
Air Filter Element	Paper	Paper	Filtron	Paper or Filtron As required	Paper	Filtron	Paper or Filtron As required

CAPACITIES

Gas Tank	2 imperial gallons/2·4 U.S. gallons/9 litres
Gearbox (Transmission)	1 imperial pint(20 fluid oz/0·57 litres
Primary Chaincase	¼ imperial pint/5 fluid oz/125 cc
Front Forks	·575 imperial pint/7½ fluid oz/210 cc

LUBRICANT GRADES

Engine	Silkolene Casterene R40 32:1
Gearbox (Transmission)	Silkolene Medium gear oil 85W/90W (EP90)
Primary Chaincase	Silkolene 7.5W fork oil (5W-10W mineral oil)
Front Forks	Silkolene Heavy Weight Fork Oil 20W
Front Tire Size	2·75 in. × 21 in.
Rear Tire Size	4·00 in. × 18 in.

TIRE PRESSURES

Dry Hard Conditions	Front and Rear 15 lb per sq. in. (1·1 kg)
Medium Hard or Sandy Conditions	„ „ „ 12 lb per sq. in. (·84 kg)
Soft or Slippery Conditions	„ „ „ 10 lb per sq. in. (·70 kg)
Very Muddy Conditions	„ „ „ 8 lb per sq. in. (·56 kg)

STEERING Head Angle 30°

FORK Trail 5·15 in.

PISTONS

Piston skirt diam. (Max.)	67·913 mm/67·887 mm (2·6738 in./2·6727 in.)
Piston clearance in bore	·076 mm/·089 mm (·003 in./·0035 in.)
Piston ring width	1·587 mm (·0625 in.)
Piston ring radial width	2·767 mm/2·615 mm (·109 in./·103 in.)
Piston ring diam. 250	68 mm (2·676 in.)
Piston ring diam. 370/410	83 mm (3·268 in.)
Connecting rod length between centers	126·97 mm/127·025 mm (4·999 in./5·001 in. – 250/370) 139·67 mm/139·725 mm (5·499 in./5·501 in. – 410)
Piston ring end gap	·178 mm/·305 mm (·007 in./·012 in.) plus 2·39 mm (·094 in.) allowance for ring peg.
Small end bush bore	17·14 mm (·675 in.)
Wrist pin (Gudgeon pin) diameter	370/410 models H & G GP 6977A 250 models ·6750 in./·6748 in. (17·145 mm/17·139 mm)

The following piston to liner clearances should be used for general and scrambles use.

250 Stormer/ Starmaker = 0.0025" (.064mm)

370/410 Stormer = 0.0035" (0.089mm) using Hepolite cast pistons.

410 Stormer = 0.004" (0.102mm) using Venolia forged pistons.

ENGINE/PRIMARY DRIVE

SECTION B1

Removing and replacing the engine/gearbox (transmission) unit

To remove the complete power unit, such as for overhauling or frame attention, proceed as follows:

1 Support the lower frame tubes on a stand or stout box.

2 Remove the exhaust system (see section K12).

3 Disconnect the rear chain at the master (split) link and remove.

4 Allow the rear brake pedal to drop clear by removing the knurled adjuster nut and releasing one end of the pedal return spring.

5 Disconnect HT (high tension) lead from the spark plug.

6 Remove the right hand side panel (two nuts and washers) and disconnect the two terminals from the ignition coil. Release the lead from the coil body by removal of the securing tape.

7 Remove the LT cable grommets from their clips.

8 Remove the two socket headed screws and fan disc washers securing the inlet manifold with carburetor attached to the cylinder.

9 Release the clip securing the air hose to the carburetor and lift the carburetor and manifold with throttle cable still attached, clear of the engine. For convenience tie the carburetor to the frame to avoid damage.

10 Collect the manifold to cylinder insulating block for re-use.

11 Disconnect the clutch cable at the handlebar control and release the two rubber clips securing it to the frame.

12 Remove the bottom engine mounting stud from the left side. (See *Fig. 1.*)

13 Remove the rear mounting stud then support the engine unit and remove the front stud. (See *Fig. 1.*)

14 Lift the unit up and tilt out of the frame to the left side.

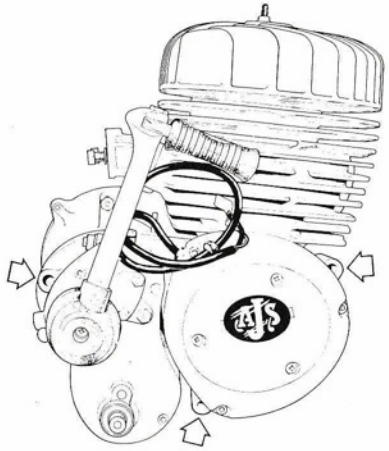


Fig. 1 Engine mounting points.

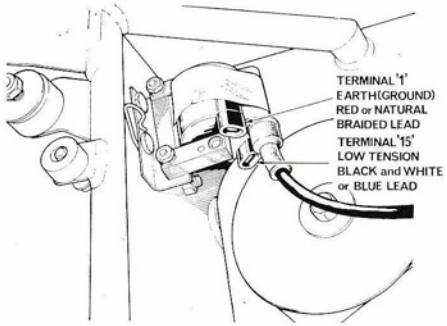


Fig. 2 Ignition coil terminals.

After removal, support the unit vertical until oil has been drained from the chaincase and gearbox (transmission).

Refitting is a direct reversal of the foregoing but take care to reconnect the leads to the ignition coil as shown in *Fig. 2,* to refit the rear chain master (split) link with the closed end facing forwards on the top run of the chain, to adjust the rear brake as required and finally to refill the chaincase and gearbox with the recommended quantity and grades of oil.

Before dismantling

For ease of handling the engine/primary drive/transmission unit should be mounted in a vise using a special clamp, part number ST 5164 as shown in *Fig. 3.* The recommended order of dismantling is as follows: Primary drive, separation of gearbox (transmission), magneto. The engine and the gearbox are then dismantled individually.

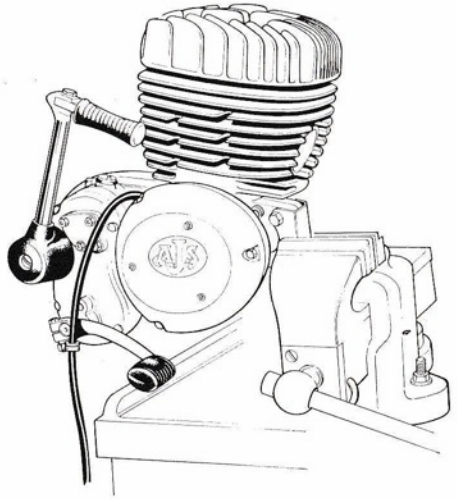


Fig. 3 Engine mounted in vise by support plate.

SECTION B2

Removing outer chaincase

The outer chaincase carries the clutch thrust mechanism which must be released before the case can be removed. Before dismantling, use the drain plug shown in *Fig. 4* to drain the oil into a suitable receptacle. Proceed as follows:

1 Remove the circular clutch cover plate (three screws) and collect the paper washer.

2 Slacken the clutch cable completely at the handlebar control.

3 Using a thin wall $\frac{1}{2}$ in. A/F socket wrench, remove the clutch operating pin locknut.

4 Using a screwdriver, screw the pin clockwise. As the pin screws through the bearing adaptor, the clutch operating arm with inner scroll will be withdrawn.

5 Disconnect the arm from the clutch cable nipple and remove.

6 Slacken the two rear, then the two center socket head screws and remove.

7 Remove the outer chaincase, collect the paper washer and, if loose, collect the two hollow dowels from the inner chaincase facing.

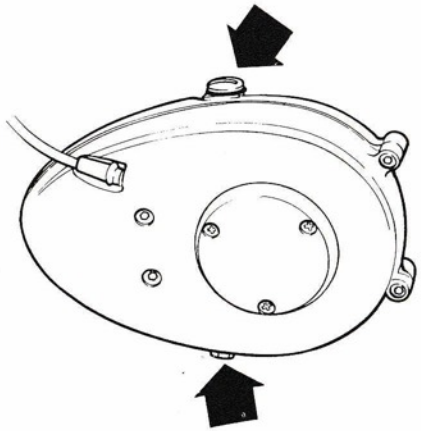


Fig. 4 Chaincase drain and filler plug.

SECTION B3

Dismantling transmission and inner chaincase

The clutch, engine sprocket and primary chain need to be removed as a set. The engine sprocket nut should be released before the clutch is disturbed. To gain access to the clutch center securing circlip, the diaphragm spring must be removed. This requires the use of spring compressor tool 0710062.

1 Assemble strap wrench 0710061 to the clutch drum as shown in *Fig. 5,* taking care not to mark the joint face of the inner chaincase. This will prevent the transmission turning.

2 Remove the engine sprocket nut, collect the spring washer; remove the strap wrench.

3 Hold the center adjuster to prevent it revolving whilst the clutch spring tool center bolt is screwed on at least $\frac{3}{8}$ in. (9·5 mm).

4 Compress the diaphragm spring as shown in *Fig. 6,* sufficiently to allow the spring to rotate in the housing.

5 Using long nosed pliers, pinch the end tabs of the large retaining circlip together and work the circlip free of the annular groove.

6 Lift out the compressor with diaphragm spring attached and release the tension of the spring: for convenience, leave the spring attached to the compressor tool.

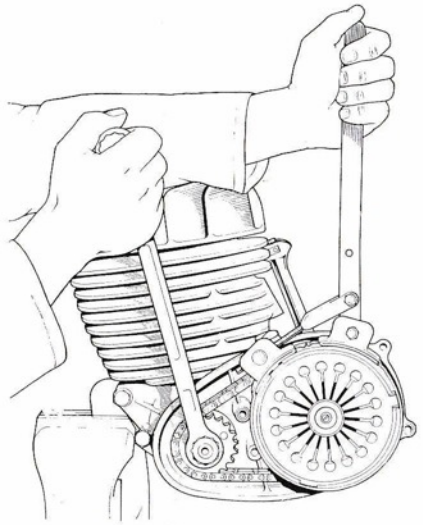


Fig. 5 Strap wrench in use on clutch.

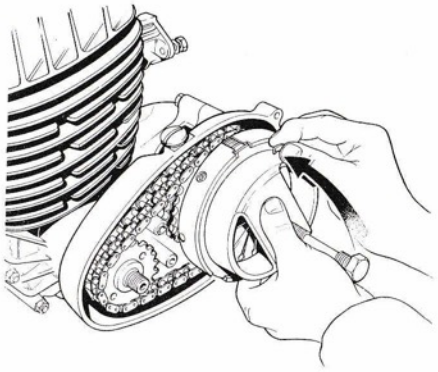


Fig. 6 Compressing clutch diaphragm spring, and using pliers to pinch circlip ends together whilst working the circlip free of the housing groove.

7 If required, the threaded clutch operating pin can be removed by taking off the small circlip. Collect the inner and outer thrust washers and thrust bearing.

8 Using expanding circlip pliers, remove the small circlip securing the clutch to the gearbox mainshaft.

9 Fitting a three bolt puller part number 0710060 as shown in *Fig. 7,* pull the engine sprocket off the crank key by securing the two outer bolts to the sprocket then tightening the center bolt.

10 Lift away the clutch, engine sprocket and chain as set.

11 If required, the clutch center can be parted from the housing by removal of the expanding circlip.

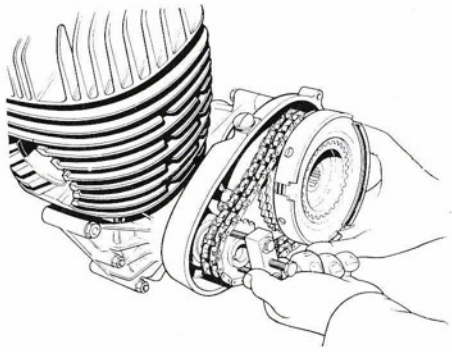


Fig. 7 Removing engine sprocket, chain and clutch as a set. Note engine sprocket puller fitted.

SECTION B4

Removing inner chaincase

Separating the gearbox (transmission)

The inner chaincase is secured by one single bolt from the top rear (not fitted to early Y4 model) and one in the center.

1 Remove the bolts and collect the fan disc washers.

2 Lift the inner chaincase away and remove the chaincase to crankcase paper washer.

3 Remove the Woodruff key from the crankshaft for safe keeping.

SECTION B5

At this stage the complete gearbox (transmission) with kickstart and gearshift levers attached can conveniently be separated from the engine. Proceed as follows:

1 Drain the gearbox into a suitable container using the brass drain plug.

2 Remove the two top nuts, single bottom nut and forward facing set-screw securing the gearbox.

3 "Rock" the gearbox carefully to break the joint at the crankcase, by grasping the kickstart and gearshift pedals. Be careful not to damage the gearbox lugs during separation.

4 Lift the gearbox away for overhaul as in Section F, place to one side and cover with a clean cloth.

5 Collect the gearbox to crankcase joint washers – count the number and record for re-assembly. These washers control primary chain tension.

SECTION B6

Dismantling the magneto assembly

Remove the contact breaker cover, magneto outer cover, flywheel, and inner cover complete with stator.

The procedure is given in detail as follows:

2 Remove the contact breaker cover (three screws).

1 Disconnect the LT (low tension) lead from the contact points set by removal of one nut and spring washer (see *Fig. 8*).

3 Remove the large magneto cover (three socket screws) and pass the LT lead and grommet back through the cover. The cover lifts away with the contact breaker still assembled.

4 Collect the two insulating strips now revealed.

5 If loose, collect the two cover dowels.

6 Remove the ignition cam circlip with expanding circlip pliers.

7 Prise the split ignition cam clear of the Woodruff key from behind using a suitable screwdriver.

8 Collect the Woodruff key.

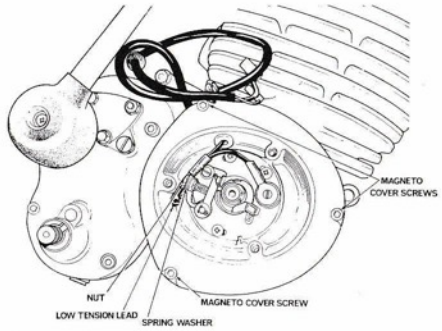


Fig 8 Showing L.T. lead position and magneto cover screws.

The flywheel is secured to the shaft by a taper and a captive self-extracting nut. The flywheel must be prevented from turning during extraction and *this must only be done with the correct strap wrench.* Any other method could result in the shaft turning in the flywheel, rendering the flywheel scrap.

9 Place the strap wrench 0710061 on the flywheel, taking care not to damage the face of the magneto backplate.

10 Using a socket or box end wrench (ring spanner) on the flywheel nut (we do not recommend using an open-ended spanner on this highly tensioned nut), slacken the nut in the normal anticlockwise direction. After initial slackness, continue to turn anticlockwise until further resistance is felt – the extractor is now functioning and by continuing to turn the nut in the same direction the flywheel will be withdrawn. (see *Fig.* 9.)

11 Store the flywheel where the magnetic segments are unlikely to attract foreign matter.

12 Collect the flywheel Woodruff key.

The stator is secured to the magneto backplate by six cruciform head screws and serrated washers and the LT lead is connected to the stator by a spade terminal which must be handled carefully. The stator can be removed separately at this stage, or removed still fitted into the cover, as desired. To remove the backplate, proceed as follows:

13 Release the three backplate socket screws and spring washers. The top left screw holds the metal cable clip in position and the bottom screw secures the earth lead. *(See Fig. 10)*

14 Lift away the backplate (with stator, if still fitted)

15 Collect the large thin "O" ring from the crankcase facing.

16 Collect the main bearing packing shims, and store carefully for re-use.

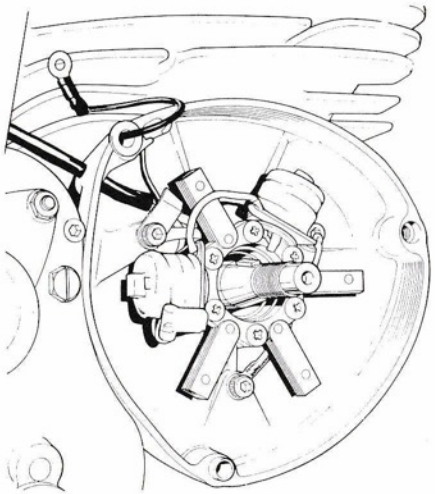


Fig. 10 Stator external connections.

Improved stator available here

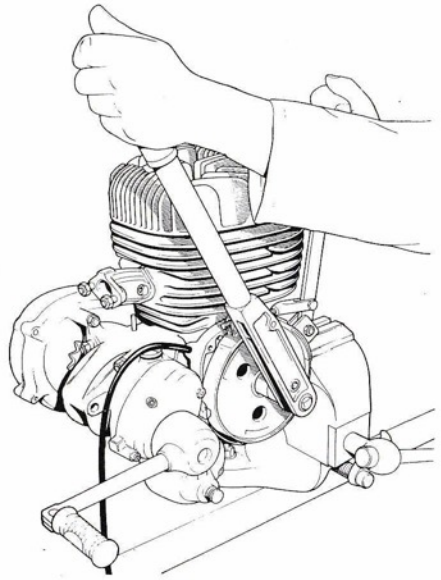


Fig. 9 Removing flywheel center nut – note use of strap wrench to prevent flywheel rotation.

SECTION B7

Engine unit

Removing the cylinder head, cylinder and piston

Removal of these components with the power unit in the frame is described fully in Section B16. During dismantling for overhaul, they can be removed most conveniently whilst the engine is still clamped in a vise. Proceed as follows:

1 Slacken off the two small cylinder head nuts first to avoid possible distortion. (These are not fitted to early Y4 models.)

2 Slacken the four large sleeve nuts – now remove all the head nuts.

3 Lift the cylinder head clear and collect the head nut washers. *Note:* No cylinder head gasket is used.

4 Remove the four long cylinder head-to-crankcase studs – these will often screw out by finger pressure only, but if not then use a stud box or two nuts locked against one another.

5 Taking care not to allow the connecting rod or piston to come into hard contact with the crankcases, lift the cylinder straight up so that the piston rings do not sprag in the ports.

6 Straightway after removal, block the mouth of the crankcase with clean non-fluffy cloth to exclude dirt. In the case of the "410" the cylinder spacer may be left *in situ*.

7 Remove the piston rings before piston removal. Take care not to break the rings which are of brittle cast iron. The rings can be expanded for removal using both thumbs. An alternative method is to insert several strips of thin brass or steel behind the rings to lift them clear of the grooves whilst they are slid off the piston body. It is important to identify the rings so that they are replaced in the same grooves during reassembly.

8 Remove both wrist pin (gudgeon) circlips with internal circlip pliers, and remove the pin as follows:

The wrist pin is a tight push-in fit and should normally be removable by hand pressure only using a suitable shouldered drift, and without the need for heating the piston body. It is essential to support the piston body from behind using the palm of the hand during this operation (see *Fig. 11*). If the wrist pin is tight, it can be tapped free by gentle use of a hammer on the drift. Leave the wrist pin in the piston to ensure that it is refitted the original way round.

9 Lift the piston clear.

10 Peel off the cylinder base gasket.

Fig. 11 Pushing out wrist pin.

SECTION B8

Removing the crankshaft

The crankcases are located relative to each other by two ground studs and held together by studs and nuts. As the cases are parted, the outer races of the main bearings remain in the cases, the bearings proper being retained on the flywheel shafts. The dismantling procedure is as below:

1 Using a socket or box wrench remove one nut from each crankcase stud. Remove the studs (the ground studs indicated in *Fig. 12* will need to be tapped out with a soft drift.)

2 Lift the crankcases apart – if necessary apply slight pressure to the drive end of the crankshaft whilst supporting the left crankcase.

3 Remove the crankshaft complete with bearing inner races.

4 If required, remove the bearing inner races by heating the crankcases, preferably in an oven to a temperature of about 100°–120°C. Bump the inner face of each case on a soft wood block which will not damage the joint facing and each bearing outer race will drop free. At the same time the left side needle roller bearing can be removed with a suitable drift and hammer.

5 To remove the bearing inner races from the flywheel shafts, a suitable bearing extractor (part number ST2350/G) will be needed.

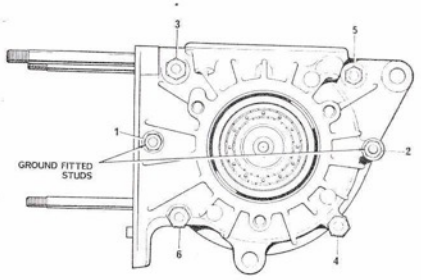


Fig. 12 Crankcase mating studs showing order of tightening. (Ground studs are arrowed.)

SECTION B9

Examination of components, transmission and engine

All components now dismantled must be washed thoroughly in clean gasoline (petrol) or Kerosine (paraffin) and should be inspected carefully for wear and damage. The various points are detailed below:

Engine bearings

Check the big end bearing for up and down movement: a certain amount of side-play is permissible, the maximum being ·012 in./·022 in. (·3048/·5588 mm). If up and down movement is perceptible or if the side-play is excessive, the crankshaft assembly should be reconditioned as in Section B10.

The main bearings and their races should be carefully checked for fitting or cracks. To check for main bearing wear the crankshaft should be fitted into the crankcases. The crankshaft should rotate smoothly without any signs of roughness and there should be no up and down movement at either end of the crankshaft.

Cylinder and piston, big end and small end bush

The inspection of these components is covered in Section B16.

Crankcases

Examine for damage to the mating surfaces and the cylinder base facing on the crankcase. Any damage or burrs should be dressed only with the greatest possible care since these joints must be 100 per cent gas tight for the unit to perform correctly. Examine the main bearing housings if the bearing outer races have been removed. A very high degree of polish indicates that the outer races have been spinning in the housings – this can be rectified only by the use of Loctite AV Grade sealant between the outer races and housings at the assembly stage. The crankcase seals should be replaced as a matter of course during an overhaul.

Examination of the clutch

Wash the clutch plates in clean petrol and examine them for signs of wear or overheating. The intermediate steel plates should be checked for distortion on a face plate. Any plates which are suspect should be replaced but the most likely cause of persistent clutch slip is a weak diaphragm spring. Examine the clutch center and, using a small file, remove any burrs which may restrict free movement of the clutch plates. Remove any burrs of indentations from the slots in the clutch housing.

Engine sprocket and clutch chainwheel

Examine the teeth for signs of hooking or severe side wear. Remove any burrs with a small file. In the case of the chainwheel, wash the bearing thoroughly in clean gasoline, blow dry with compressed air and lubricate with clean mineral oil. Note that the bearing cannot be replaced without removal of the housing-to-chainwheel rivets.

Clutch thrust mechanism

Check for severe wear on the inner and outer scrolls and remove any burrs with a small file or stone. Finally check that the clutch thrust mechanism works easily with no binding.

Chains

The primary chain works in an oilbath and with correct oil level maintenance will have a very much longer life than the rear chain. The chain rollers should be examined carefully for damage–arduous competition conditions may result in broken rollers.

The rear chain being exposed to the elements must be examined for excessive stretch which if allowed to continue in service, will damage the sprockets. Before examination the chain must be washed thoroughly in kerosene (paraffin) and if possible degreased. The chain can now be checked for stretch. To do this place the chain on a clean flat surface. Make a chalk mark opposite the center of the first pivot pin. Compress the chain to its minimum and mark again at exactly 12 in. (30·5 cm) from the first mark. This should coincide with the center of the pivot pin for the thirty-second link. Hold the first end of the chain and expand the chain to its maximum. If the chain is fit for further service the extension beyond the second mark should not exceed ·25 in. (6·25 mm). The rear chain master link must be replaced periodically since wear on the loose side plate weakens the link after a period of use.

Examination of electrical components Flywheel

The relationship of the stator to the flywheel is important to provide the maximum flux. Therefore check that the keyways in both the flywheel and crankshaft are in

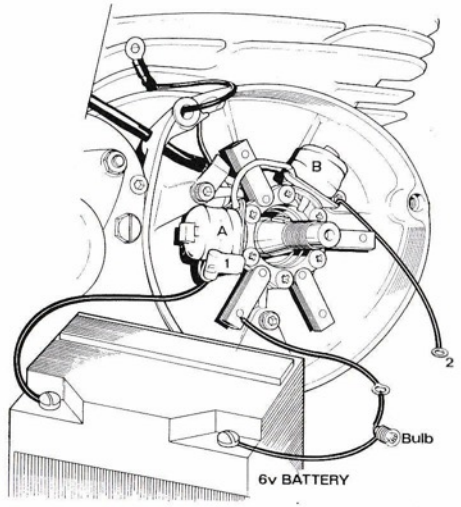


Fig. 13 Stator continuity test.

good condition and that the Woodruff key is a good fit and undamaged. The only check which can be made readily on the magnetic segments is by comparison – weak magnetism can be detected by taking a bar of soft iron and comparing the "pull" at the four poles between the existing and a new flywheel. Weak magnetism necessitates replacement or remagnetizing of the flywheel. On an ignition – only set of this type, the flywheel will still operate with 40 per cent loss of magnetism, though starting will be impaired. Note that there are two "dead" segments to the flywheel as designed.

Stator

Check that all external connections are clean and securely soldered – dry soldered joints making intermittent contact can prove very difficult to trace. Check in particular that at the spade terminal blade the solder bridges the blade to the eyelet. An epoxy resin compound prevents the spade terminal from rotating and fracturing the wire – if the bonding is insecure, re-fix.

Field testing

Check the stator for electrical continuity using a 6 V battery, bulb and lead. Preferably with the stator still mounted to the engine, disconnect the earth terminal of the stator coils. Connect the battery to the laminations and the second battery lead to the spade terminal via the bulb (see *Fig. 13*). The bulb should not light – if it does, the coils are shorting to ground (earth) and must be replaced.

Now check the circuits by connecting one battery terminal to the spade terminal and the other battery terminal via the bulb (see *Fig. 14*) to the ground (earth) terminal. Failure to light indicates a break in the circuit which can be identified by a stage by stage check.

Bench testing

A "growler" or means of inducing mains current is necessary for testing coil energising.(see *Fig.15*)

Test 1 (a) Induce mains current to the top of energising coil A and to the adjacent arm of the stator lamination.

(b) Connect a lead and bulb (6 V 3 W or 6 V 6 W) across points 1 and 2 – if the bulb lights all is well: if not the coil is not energising and must be replaced.

(c) Still with current induced, touch the bulb lead, previously connected to 1, to earth. The bulb should not light: if it does, the coil is shorting to ground (earth).

Test 2 Repeat above but this time inducing current to coil B and adjacent arm of stator lamination. The same conclusions apply.

Ignition coil

Examine for loose and dirty connections. Periodically "work" the spade terminals in the coil connections

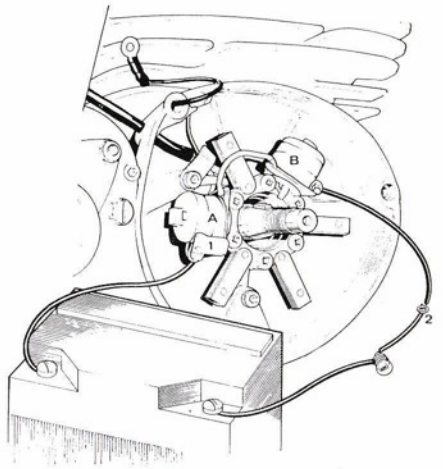


Fig. 14 Stator circuit test.

and do not push too far home, to ensure good contact. If the coil is suspect, a simple check is to connect the coil into a normal automobile electrical system. If the automobile runs correctly, the Stormer coil is sound and the condenser should be checked next.

Using a moving coil multi-meter (Avometer) disconnect the ignition coil CB lead, insulate the CB points from one another then test resistance on high range to earth. An "O" reading indicates a faulty condenser or breaking down of the internal insulation. No reading indicates that the condenser basically is satisfactory. Badly pitted CB points indicate a lack of condenser capacity.

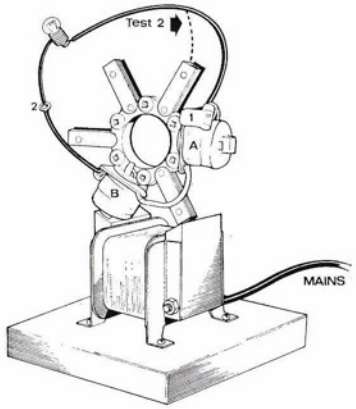


Fig. 15 Stator bench testing.

SECTION B10

Overhauling the crankshaft

Dismantling

Prior to dismantling, the crankcheeks should be marked across both rims (the marks can be seen in *Fig. 18*) to aid alignment during reassembly. The markings should be made with a steel rule and scriber. Proceed as follows:

1 Remove both crankpin plugs. These are of extremely hard material and can only be drilled out using a solid carbide drill. As an alternative, the crankpin is bored straight through thus both plugs can be removed by pressing straight through from the one side. If drilling the plugs for removal support the crankshaft assembly to allow the hardened crankpin plugs to be drilled through. The plugs are extremely hard and thus difficult to drill out. Collapse the remaining wall of each crankpin plug and remove.

2 Using support rig. part No. ST 5166 below the top crankcheek as shown in *Fig. 16* support the crankshaft assembly in a suitable press (a fly press is ideal).

3 Lift clear the connecting rod and thrust washers.

4 Place a suitable press tool on the crankpin, taking particular care that the tool does not overlap the crankpin for otherwise the crankcheek bore will be damaged. Now apply the press to push the crankpin (still captive in the lower crankcheek) out of the upper crankcheek (see *Fig. 17*).

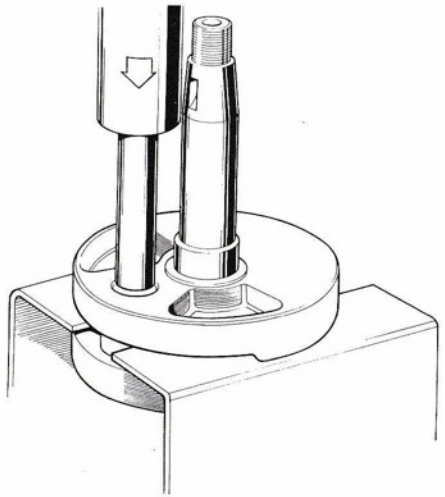


Fig. 16 Supporting the crankshaft assembly whilst pressing out the crankpin.

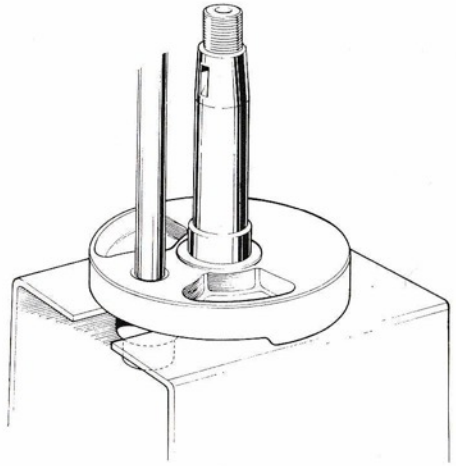


Fig. 17 Supporting second crankcheek to remove crankpin.

Reassembly

For the completed engine to function as intended, absolute accuracy of crankcheek alignment is essential and it will be noted that the procedure detailed below includes many accuracy checks.

We do not supply crankcheeks as separate spares. The reason is that an oversize crankpin 0710137 must be used during reassembly. The big end diameter is the same diameter as the original crankpin but the end diameters are ·001 in. oversize to cater for the reduction in crankcheek bore interference after removal of the worn crankpin. To attempt replacement of one crankcheek only would bring about the condition where the oversize crankpin was excessively tight in the new crankcheek.

1 Take either crankshaft and mount in a fly press so that the shaft is supported clear of the bed and there is slight clearance below the crankpin bore.

2 Place one end of the crankpin in position on the bore of the crankcheek and press home until the shoulder abuts.

3 Place one thrust washer in position over the crankpin (see *Fig. 18*).

4 Lay the big end needle roller bearing over the crankpin.

5 Lubricate well the needle roller bearing using the same type of oil on which the engine will run, i.e. mineral or bean (vegetable) oil.

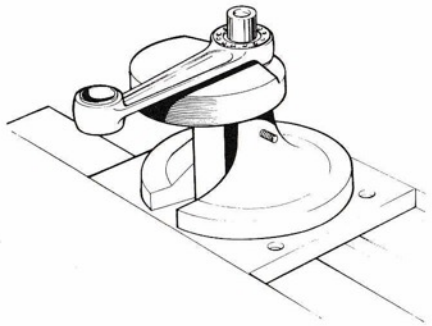


Fig. 18 Crankcheek and crankpin showing connecting rod and thrust washers in position.

6 Place the connecting rod in position and check that the big end eye of the connecting rod clears the edge of the crankcheek recess whichever way round it is fitted. When a new crankcheek is being fitted, careful fettling is sometimes necessary to ensure clearance.

7 Place the second thrust washer over the crankpin.

8 Position the top crankcheek over the crankpin, visually aligning the two crankcheeks and the edge of the cutaway areas (see *Fig. 19*).

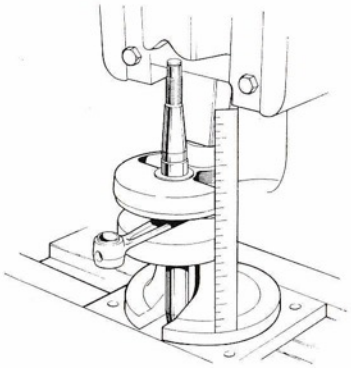


Fig. 19 Using steel rule to align crankcheeks prior to final assembly.

9 Using a press tool that is long enough for the crankshaft to clear the press, start to press the crankcheek over the crankpin. Make sure that the thrust washer is fitting properly over the crankpin and press the crankcheek fully home

10 To ensure that the crankpin shoulders abut to the crankcheeks, support the area around the crankpin end on a tubular tool whilst pressing first one crankcheek then the other.

11 Check the connecting rod big end eye to thrust washer clearance: this must be ·012 in–·022 in. (·3048/·5588 mm). If correct proceed. If excessive press up the assembly further.

At this stage, checking commences using a pair of DTI (Dial Test Indicator) gauges on the shafts whilst the crankshaft assembly is mounted between centers shown in *Fig. 21*. Ultimate shaft truth of no more than 0·001 in (·0254 mm) overall is required.

12 Revolve the crankshaft with the two DTI instruments resting on the crankshafts as near possible to the shoulders. Initial truing establishes the correct rotational relationship of the crankcheeks to one another. At the commencement it is anticipated that the crankcheeks will be eccentric to one another thus the DTI instruments will indicate, one anti-clockwise and one clockwise.

13 Remove the crankshaft assembly from the centers and correct any eccentricity by the use of a lead maul or soft faced hammer on the high point of whichever flywheel requires re-alignment (see *Fig. 20*). Continue this process until both DTI gauge pointers rotate clockwise. Now proceed to checking shaft truth.

Fig. 20 Re-aligning crankcheeks using a soft faced hammer.

14 Re-mount the crankshaft assembly and note the DTI movement. At this stage the indicated out-of-truth will be in the order of 0·005 in. (·1270 mm) approximately.

15 Spring the crankcheeks slightly at the point indicated by the gauges, using a leverage bar – this can be carried out with the assembly mounted (see *Fig. 22*).

16 Recheck alignment of the shafts and continue until final alignment errors is no more than 0·0005 in. (·1270 mm) or at maximum 0·001 in. (·0254 mm).

17 Recheck connecting rod big end side play.

18 Mount the assembly in a press to insert the crankpin plugs. Support the crankshaft assembly, especially the lower end of the crankpin and press in the first crankpin plug, chamfer first. The plug must recess slightly below the crankcheek surface.

19 Turn the assembly over and fit the second crankpin plug.

20 As the last operation, make a final check on shaft alignment and connecting rod side play.

The crankshaft assembly is now ready to assemble to the engine.

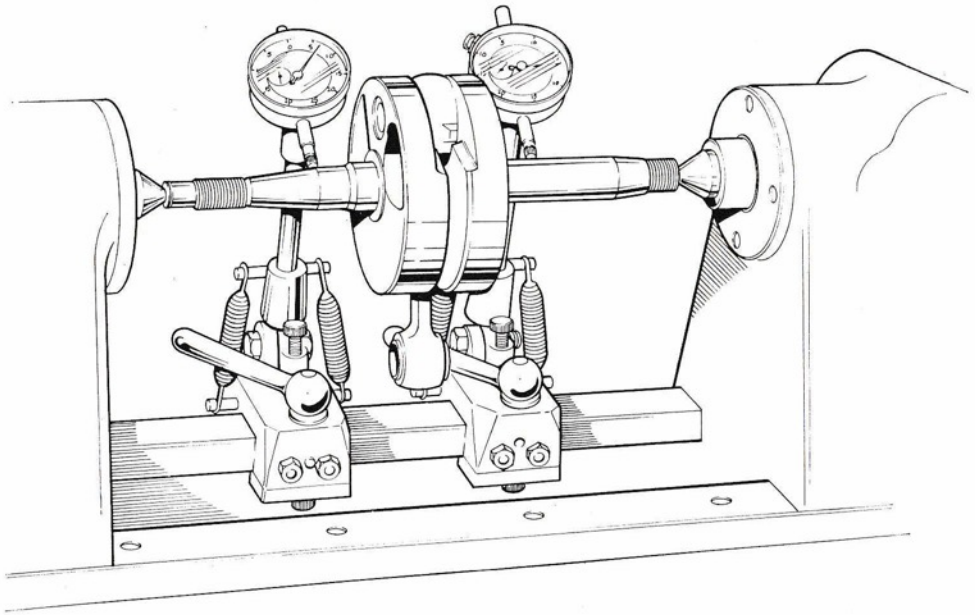


Fig. 21 Crankshaft assembly mounted between centers for checking truth.

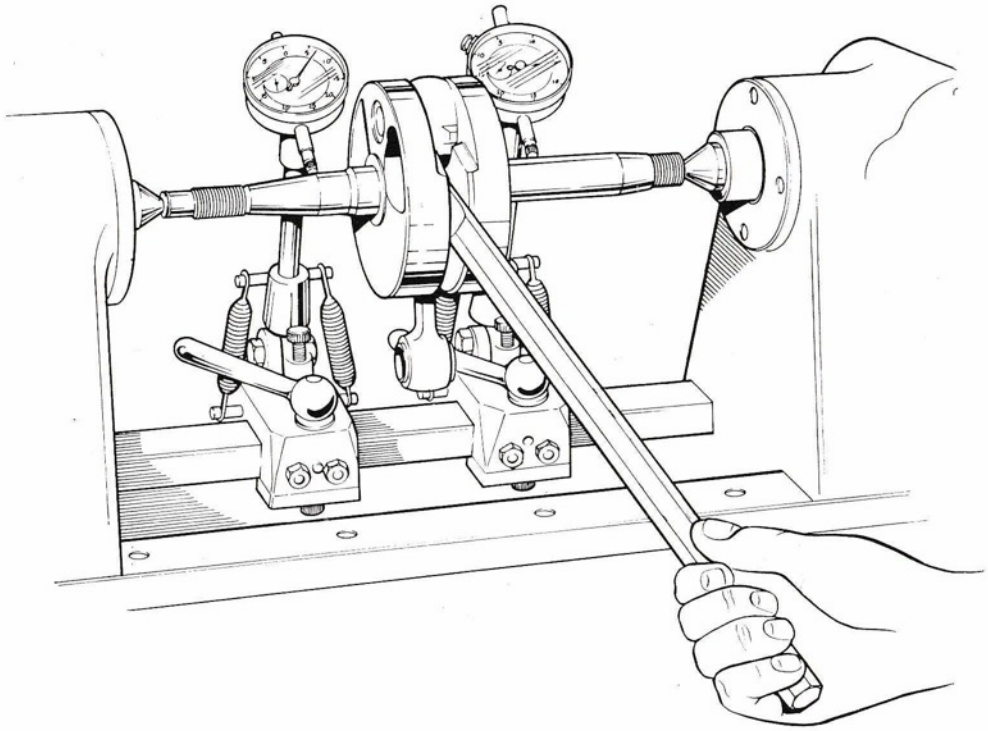


Fig. 22 Springing crankcheeks using a leverage bar.

SECTION B11

Reassembling the crankcases

The crankcases should have the bearing outer races and crankcase seal fitted whereupon the crankshaft with main bearings is offered. After the cases are bolted together, crankshaft end float is checked as part of the fitting operation of the magneto inner cover – see Section B12. The following order of assembly should be followed:

1 If the main bearing outer races and needle roller bearing have been removed, heat the crankcases, preferably in an oven, to 100°–120°C.

2 Assemble the needle roller bearing to the left side case (that is, the clutch side) with a suitable drift, flush with the outer edge of the case.

3 Fit the left side roller bearing (three spot type) outer race with the lipped portion towards the outside of the crankcase, adjacent to the needle roller bearing.

4 Fit the left side crankcase seal fully home – the pressure (spring) side faces the crankshaft.

5 Assemble the right side bearing (three spot type) outer race (lipped portion outboard towards the magneto) to the right crankcase – ensure that the race stands slightly proud of the crankcase inner surface.

6 Using a metal tube $2\frac{3}{4}$ in. long × 0·9 in. internal diameter, suitable washers and the engine sprocket nut, fit the left side roller bearing inner race to the drive side crankshaft as shown in *Fig. 23*.

7 Fit the right side bearing inner race in a similar manner but using a $\frac{9}{16}$ in. UNF nut.

8 Ensure both crankcase joint facings are perfectly clean and apply a thin even coating of pliable jointing compound to both.

9 Mount the left crankcase in a vise with soft jaws see *Fig. 24*.

10 Smear the oil seal with lubricant – for preference use a molybdenum disulphide based grease.

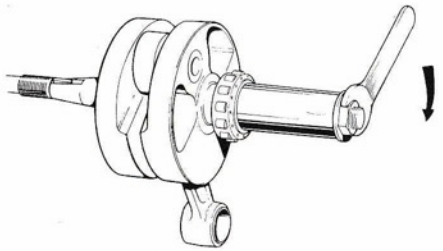


Fig. 23 Assembling main bearing inner race to left crankshaft using a length of steel tubing.

Fig. 24 Left crankcase held in vise using soft jaws to avoid damage.

SPECIAL NOTE

The oil recommendation is for R40 – a castor based (bean oil) lubricant. Some riders for special requirements prefer a mineral oil. Whenever mention is made of lubricating parts during assembly, it is essential to use only the type of lubricant, i.e. vegetable or mineral, which will be used in service. A reaction will take place if the two types of oil are mixed.

11 Lightly oil the main bearings.

12 Lower the drive shaft through the bearings and seals taking care not to damage the oil seal lip whilst guiding the connecting rod into the crankcase mouth. A diagram showing the crankshaft in the cases is given in *Fig. 26*.

13 Place the second half of the crankcase over the crankshaft – in case of difficulty in closing the halves, remove the crankcases from the vise, invert, and the cases will close up.

14 Place the two ground studs in position and push fully home. Replace the nuts and tighten lightly.

15 Fit and tighten lightly the remaining four bolts.

16 Tighten all the crankcase stud nuts in the order shown in *Fig. 12*.

17 Bolt on the clamping plate and mount in a vise.

SECTION B12

Reassembling the magneto

The magneto backplate carries the right crankcase seal and it is essential for the joint between the backplate and crankcase to be gas-tight. Crankshaft end float is controlled by shims inserted between the magneto backplate spigot and the outer edge of the right main bearing. Proceed as follows:

1 Ensure both joint faces are perfectly clean.

2 Fit a new crankcase seal – lip towards the crankcase.

3 Press the large thin "O" ring into the crankcase facing.

4 Refit the shims over the right main bearing. The same number of shims which were removed during stripping must be used, if the same crank is refitted.

5 Fit the magneto backplate and fit and secure the three socket screws.

6 Check that crankshaft end float is correct. The recommended figure is ·010 in.–·004 in. (·240/·1016 mm) checked by end movement on the crankshaft. The point at which end float figure is checked is shown in *Fig. 25*. If the end float figure is incorrect, remove the backplate and add or subtract shims until the correct figure is achieved. After removal of shims the crankshaft should be driven towards the flywheel to re-seat the main bearing race before re-checking. At each stage the magneto backplate must be refitted and secured for checking.

7 When the end float figure is correct fit the cover.

The backplate bottom screw locates the ground (earth) lead and the top left screw secures the clip retaining the ground and LT leads. During tightening, take care not to strain the ground lead and ensure that the lead clip is positioned correctly to avoid cutting into the leads.

8 Secure the three socket screws for the inner cover.

9 If the stator has been removed separately, position the stator against the backplate, fit and secure the six screws. Connect the LT spade terminal with care – the male spade is bonded to the stator coil. Check each permanent connection between the coils is secure (see *Fig. 10*) and that the ground terminal is captive beneath the magneto backplate bottom screw.

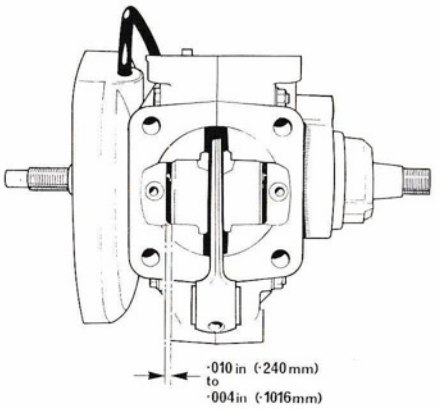


Fig. 25 Showing crankshaft end float checking point at crankcase mouth.

10 Remove any burrs from the flywheel Woodruff key and locate the key in the shaft.

11 Ensure the tapers in the flywheel and on the crankshaft are grease-free and dry and apply "Loctite" AV grade compound.

12 Check that the flywheel is free of adhering metallic particles (note that two of the segments are non-magnetic) and turn the crankshaft until the key is uppermost. Position the flywheel keyway uppermost and push the flywheel home as far as possible.

13 Screw on the center nut the first few turns

14 Rotate the flywheel slightly until it locates onto the key and finger tighten as far as possible.

15 Fit the strap wrench onto the flywheel (be careful not to damage the magneto backplate face), tighten the center nut to the correct torque reading (100 ft/lbs).

16 Refit the two insulator strips to prevent the leads fouling the flywheel.

17 Fit the cam small Woodruff key to the shaft.

18 Push the cam over the shaft and key (counterbore in and arrow marking out).

19 Fit the cam retaining circlip to the shaft and ensure that it is located fully into the groove.

20 Ensure that the magneto backplate and magneto cover joint faces are perfectly clean then apply pliable jointing compound.

21 Thread the LT lead through the cover and locate the grommet.

22 Push the magneto carefully over the insulating strips and into position.

23 Secure with the three socket screws and tighten down equally.

24 Re-time the ignition as in Section E1.

25 Reconnect the LT lead and refit the cover plate using a new paper washer. Secure the three screws.

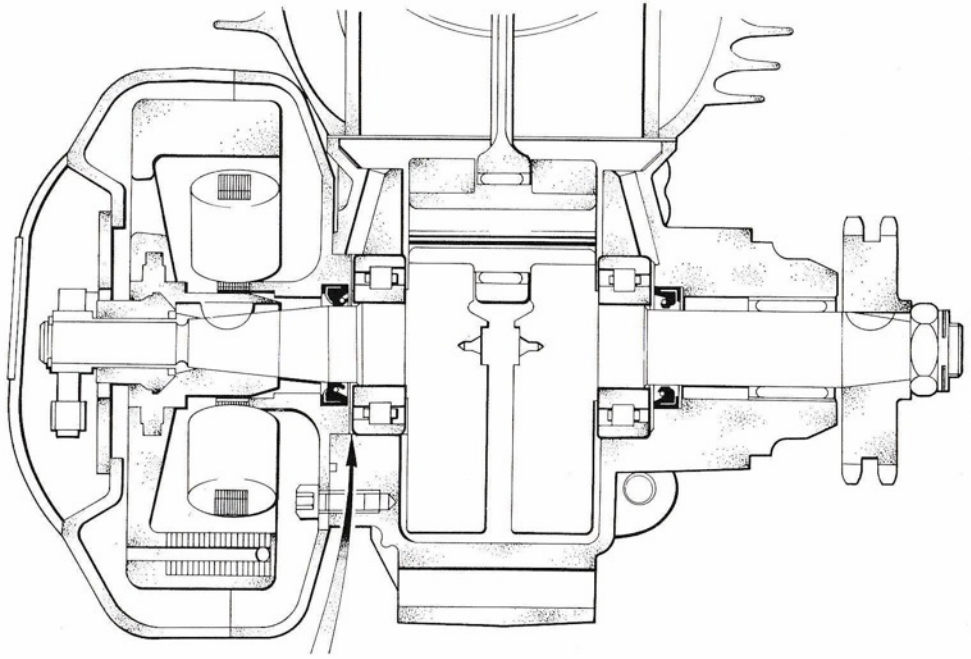


Fig. 26 Diagram of crankshaft fitted in crankcases—arrow indicates point of shimming crankshaft and float.

SECTION B13

Refitting the piston, cylinder and cylinder head

If for any reason either the cylinder head or barrel are replaced, the joint faces must be lapped together since no head gasket is fitted, and there would be a distinct possibility of the joint leaking without this treatment. Before assembly to the engine, ensure that both joint faces are perfectly clean and free from foreign matter. With the head and barrel removed from the motor, apply a smear of medium grinding paste all round the top of the cylinder liner facing. Place the head in position and rotate it back and forth under hand pressure, rotating the head in relation to the barrel in 90° stages. When an even dull pattern appears over the whole liner facing, lift the head and clean the joint faces completely with gasoline and clean rag and the parts are ready for fitting.

1 Lubricate the small end bush and the piston bosses with clean oil of the correct type.

2 Fit one circlip to the piston.

3 Cover the crankcase mouth with clean non-fluffy cloth.

4 The piston crown is stamped "Front" for location – offer to the connecting rod and slide the wrist pin into position.

5 Fit the second wrist pin circlip and recheck that both circlips are completely bedded into the grooves by rotating the circlips.

6 With great care fit the piston rings to the body (note the rings are stamped "Top" for location) *in the same grooves from which they were removed.* It is necessary to expand each ring with the thumbs during this operation. Turn the rings so that the ring ends fit to the locating pegs in the piston body, and lubricate the rings and piston.

7 Apply a pliable jointing compound to the cylinder base facing and place the new base gasket on the facing – it is essential for the gasket to be fitted

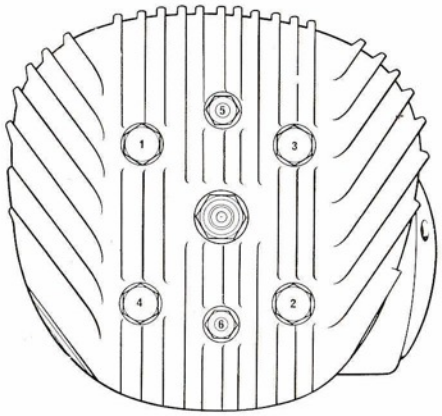


Fig. 27 Cylinder head nut tightening sequence.

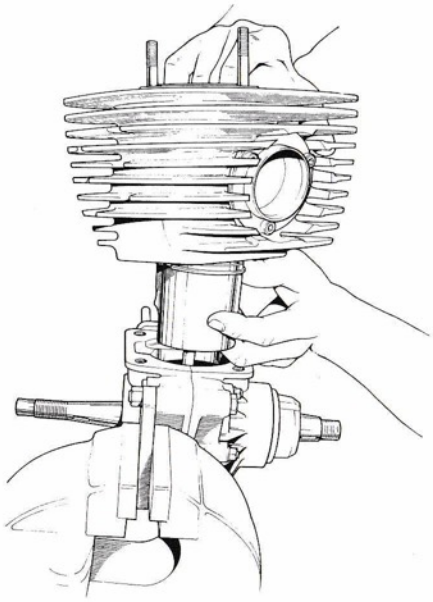


Fig. 28 Positioning cylinder over piston for assembly.

the right way round or the transfer ports will be partially masked. In the case of the "410" the cylinder base spacer must be fitted next followed by a second cylinder base gasket.

8 Position the piston at bottom dead center and offer the cylinder over the piston at 45° to the centerline (see *Fig. 28*) to keep the ring ends clear of the ports. Tilt the cylinder slightly, away from the top piston ring locating peg so that the complete side of the ring enters the bore, chamfer first. Now level the barrel to enter the remainder of the ring and the second ring. Bring the piston to TDC, revolve the cylinder to its final position and push the cylinder over the piston and down onto the crankcase facing.

9 Screw the four cylinder long studs (coarse thread down) through the cylinder, cylinder base gasket and into the crankcase. Screw the studs home until the bottom two threads are visible before the crankcase bosses and the tops of all studs are level.

10 Ensure that the cylinder head to barrel joint faces are perfectly clean, then fit the cylinder head and place the nuts in position finger tight.

11 Tighten the cylinder head nuts in the sequence shown in *Fig. 27*. The correct torque settings are:

Cylinder head large nuts 21 lb/ft (2·9 Kg/m).

Cylinder head small nuts 11 lb/ft (1·55 Kg/m).

Note: The early Y4 model had four large cylinder head nuts only and these should be tightened diagonally to 21 lb/ft (2·9 Kg/m).

SECTION B14

Reassembling primary drive and inner chaincase

It will be found more convenient to continue reassembly from this point with the engine mounted in a vise. It is necessary to assemble the gearbox (transmission) to the engine as part of this operation since the number of gearbox to crankcase joint washers governs primary chain tension. Proceeds as follow:

1 Ensure that the joint faces of the engine and gearbox are perfectly clean and apply a pliable jointing compound to the crankcase surface.

2 Fit the same number of paper washers that were removed when the unit was dismantled.

3 Make sure that both locating dowels are fitted and place the gearbox in position over the studs.

4 Tighten evenly the three nuts and single bolt. Before fitting the inner chaincase offer the clutch housing with center assembled, engine sprocket and primary chain as a set, and check chain tension on the bottom run. The maximum free play (that is, from full up to full down) should be $\frac{1}{4}$ in. to $\frac{5}{16}$ in.(6·35 to 7·95 mm). If tension is outside these limits add or subtract gearbox-to-crankcase joint washers. When tension is correct, remove the sprockets and chain and proceed with reassembly.

5 Ensure that the chaincase to crankcase joint faces are perfectly clean and that the dowel is fitted at the top gearbox boss.

6 Apply jointing compound to the crankcase face and place a new gasket on this face.

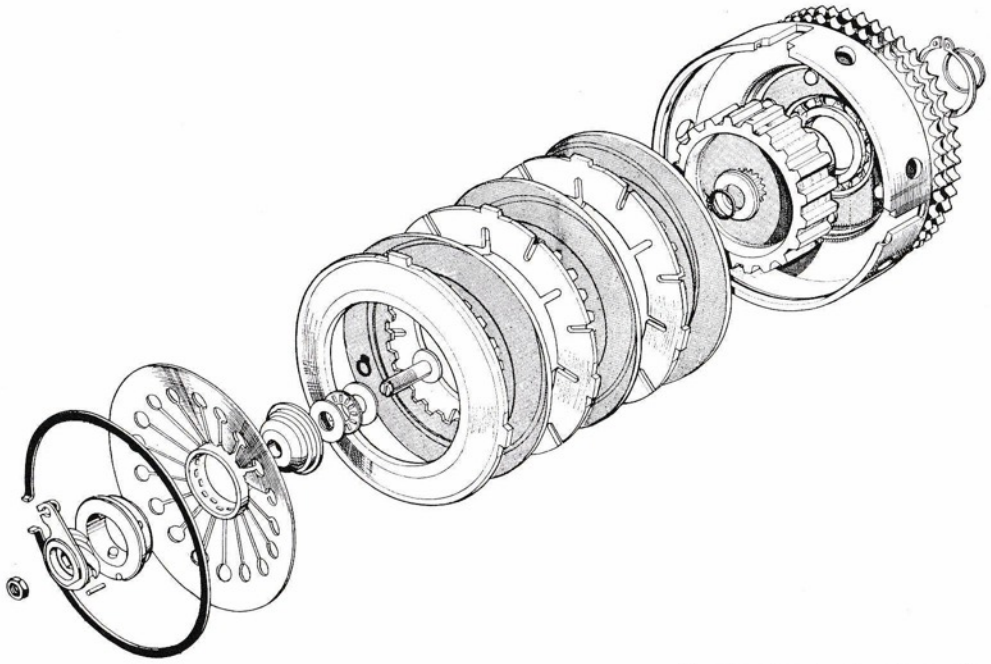


Fig. 29 Clutch order of assembly.

7 Smear the lip of the oil seal in the inner chaincase with a molybdenum disulphide based grease and place the chaincase in position.

8 Fit and secure evenly the center set screw with fan disc washer, and top rear bolt with fan disc washer.

9 Replace the Woodruff key in the engine shaft and fit the engine sprocket, chain and clutch sprocket (with center assembled) as a set.

10 Secure the clutch housing and center to the mainshaft with the retaining washer and new circlip. It is important that circlip pliers are used, that the "sharp" side of the circlip faces away from the clutch, and also that the circlip is fully bedded in the groove and can be rotated.

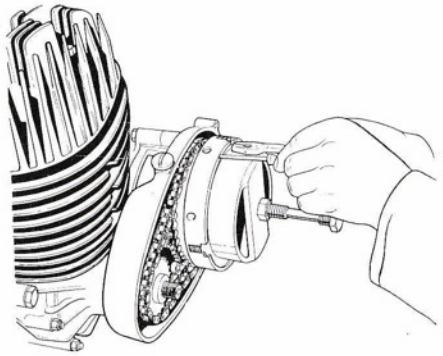


Fig. 30 Fitting the clutch large circlip with the diaphragm spring compressed.

Clutch spring compressor available here

11 Assemble the clutch plates as in *Fig. 29* with a sintered bronze friction plate first in the housing followed by a plain steel plate alternately. The pressure plate is outermost with the chamfer outboard.

12 The diaphragm spring and clutch operating pin together are still fixed to the compressing tool. Retension the spring by tightening the center bolt. If the diaphragm spring is being renewed, note that the 410 part is identified by a yellow paint marking.

13 Hold the diaphragm spring and tool in position in the housing and ensure the circlip groove is free of foreign matter. Insert the left hand ear of the circlip and grasping the other end (see *Fig. 30*) peel the circlip into position. Check the circlip for security and tap both ends to ensure proper seating. Release the tension on the diaphragm spring and remove the compressing tool.

14 Fit strap wrench 0710061 to the clutch housing, taking care not to damage the joint face of the chaincase. This will lock the transmission whilst the engine sprocket is secured by the spring washer and nut, the nut being secured to a torque setting of 90 lb/ft.

SECTION B15

Refitting the outer chaincase

1 Ensure that the joint faces of the inner and outer chaincases are perfectly clean, apply a pliable jointing compound to the facing of the inner chaincase and attach a new gasket.

2 Check that both hollow dowels are in position and fit the outer case.

3 Fit and secure the four socket screws – note that the long screws are in the center of the case.

4 Assemble the clutch operating arm and use a small screwdriver to turn the operating pin in the center anti-clockwise – this draws the clutch operating arm into position.

5 Screw the operating pin right out anti-clockwise until it is rigid.

6 Fit the locknut – do not tighten. Use a box spanner and screwdriver to adjust until there is $\frac{3}{16}$ in. (4·7 mm) free play on the scroll arm (see *Fig. 31*.) Secure the locknut.

7 If the transmission has received attention in the frame, at this stage add the recommended quantity and grade of oil.

SECTION B16

Top end attention to engine in frame Dismantling and decarbonising

Whilst the full overhaul procedure is covered in detail in this manual, it is in order to carry out attention such as decarbonising and piston ring changes with the unit in the frame. The procedure for dismantling to crankcase level, examination and reassembly is as follows:

1 Remove the exhaust system (see Section K12).

2 Remove the two socket screws and fan disc washers securing the inlet manifold to the cylinder barrel.

3 Detach the fuel line at the gas (petrol) tap.

4 Slacken the air hose clip at the carburetor. The inlet manifold, carburetor and fuel line as a group, attached to the throttle cable, can then be tied to the frame out of the way as dismantling proceeds,

5 Remove the sparking plug and store safely for re-use.

From this stage, follow items 1 to 10 of Section B6. When the cylinder, piston and rings have been removed, use a scraper fashioned from soft metal, hard wood or plastic to remove the carbon deposits from the piston crown. Similar scrapers suitably shaped should be used to clean out the parts and the combustion chamber of the cylinder head. Do not use files, screwdrivers or emery cloth. Using part of an old piston ring, remove the carbon deposits from the piston grooves, taking care not to damage them in any way. A small triangular scraper should be used to remove any aluminum which may have scuffed over the edge of the groove.

Examination. Examine the cylinder bore, preferably in good natural light, and look for any signs of temporary seizure or damage to the ports. Small particles of aluminum adhering to the surface of the bore should be removed with a bearing scraper and finished off with very fine emery cloth and kerosene (paraffin). If the edges of the ports are chipped they should be radiused slightly but the port size and shape must not be altered.

Wavelike ripples on the bore surface may be the result of overheating or insufficient lubrication. Light scoring may be caused by particles of grit or dust finding their way into the engine, possibly through an inefficient air filter. Excessive bore wear will be indicated by a definite ridge at the upper limit of piston travel and to determine the exact amount of wear or ovality the bore should be measured with a clock gauge micrometer. Measurements should be taken at right angles to the wrist (gudgeon) pin axis, i.e. on the thrust faces where most wear takes place and at various points within the length of piston travel. When the overall wear is greater than ·005 in. (·1270 mm) the liner should be rebored and an oversize piston fitted. +·010 in., +·020 in., +·030 in. and +·040 in. pistons are available. The bore should be honed to a surface finish of 30/45 micro inches and 45° cross hatching. Prior to honing the ports should be radiused ·030 in. (·762 mm). If bore wear is negligible, leave well alone, a seasoned cylinder bore is preferable to one which will have to be run in again.

The piston skirt should be a dull matt grey with no signs of deep scoring and should not be touched unless there are "high spots" which appear to have "picked up". These can be smoothed down by careful use of a flat carborundum stone dipped in kerosene (paraffin). Only areas likely to cause distress should be treated. The upper lands of the piston may be slightly lacquered and may show high spots at right angles to the wrsit pin axis. This is not important unless the rings have been trapped in their grooves or show a tendency to stick. If so, the groove should be carefully eased with a scraper until the ring is free to move in the groove around the full piston circumference.

The piston ring faces where they are in contact with the cylinder bore should be of an even brightness apart from the taper face. If there are signs of discolouring or scoring, the rings should be renewed.

The big end bearing should be checked at this stage. Rotate the engine until the connecting rod is at the top of its stroke, grasp the rod firmly at the bottom and without twisting the rod or moving it sideways, attempt to lift it up and down. If appreciable movement is felt, the bearing can be regarded as unserviceable. A certain amount of side movement is permissible, the limits being ·012 in./·022 in. (·3048/·5588 mm). If this is exceeded, the crankshaft assembly should be reconditioned as in Section 10 or a replacement flywheel and big-end assembly should be fitted. Similarly, excess wear on the small end bush will necessitate the fitting of a new connecting rod with small end bush, crankpin and big end bush. The small end bush is not supplied separately for the reason that a bush could not be reamed sufficiently accurately in position.

Reassembly. This operation is basically a reversal of the dismantling procedure but it is advisable to follow in detail Section B12. This covers complete assembly of the engine, and ancillary equipment should be refitted as a straight reversal of the dismantling procedure.

SECTION B17

Clutch cable

To change the clutch cable, proceed as follows:

1 Detach the handlebar control end first – to do so, turn the adjuster at the lever until the slot faces forwards, then grasp the outer cable to pull the ferrule clear of the lever abutment so that the inner cable nipple can be disengaged from the lever.

2 Remove the inspection cover at the chaincase (three screws).

3 Disengage the cable nipple from the clutch thrust arm.

4 Slide the cable shroud clear along the outer cable.

5 The cable abutment with "O" ring fitted is a tight fit into the chaincase. Lubricate with oil, and with care tap the abutment fully into the chaincase. Slide the cable shroud over the abutment.

6 Connect the cable nipple to the operating arm. (See *Fig. 31*.)

7 Reconnect the cable nipple to the handlebar control – ensure that the adjuster slot through which the cable has passed does not face forwards.

8 Adjust the clutch at the operating arm and cable as detailed in Section B18.

SECTION B18

Clutch adjustment

1 Remove the circular inspection plate from the chaincase (three screws) and collect the gasket.

2 Check adjustment at the clutch operating pin with the cable adjustment slackened right off. As shown in *Fig. 31* it should be possible to rotate the operating lever to and fro for $\frac{3}{16}$ in. (4·7 mm)

3 When the free movement is taken up there should be a gap of $\frac{1}{16}$ in. (2·116 mm) approximately between the inner face of the operating lever and the outside of the fixed scroll.

4 If adjustment is necessary, slacken the lock-nut and with a small screwdriver turn the clutch adjusting pin in the required direction: the pin screws through a captive nut located in the outer scroll.

5 When adjustment is correct, retighten the lock-nut and adjust the clutch cable to give $\frac{1}{8}$ in. to $\frac{3}{16}$ in. (3·2 to 4·7 mm) free movement at the handlebar lever.

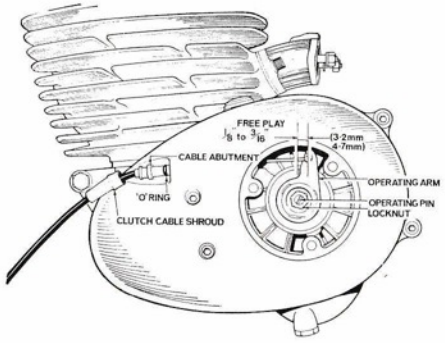


Fig. 31 Clutch thrust adjustment.

LUBRICATION

SECTION C

Lubrication

Engine

The Stormer engine is lubricated by oil mixed with fuel in a proportion to suit the requirements of the engine. The actual fuel to oil ratio has been decided upon after rigorous testing under all conditions likely to be encountered. A bean (vegetable) castor-based oil is recommended to be mixed in the proportion of 20 to 1 – that is, twenty parts of gasoline (petrol) to one part of oil. Use premium gasoline (petrol) of not less than 98 octane (4 Star in U.K.) rating. We recommend a castor base oil of SAE40 viscosity, such as Castrol R40.

Bean (vegetable) oils must never be mixed with normal mineral oil. Its anti seizure properties are superior to those of any other lubricant and it clings very tenaciously to very hot surfaces. It does not mix as readily with gasoline as mineral oil and, if left standing for 2 to 3 days, has a tendency to separate. If this happens, the fuel should be drained off and thoroughly remixed before being returned to the tank. Separation takes place more rapidly at temperatures below freezing point.

It is important to keep the exterior of the engine and gearbox unit clean as a bean (vegetable) oil will form gummy deposits which are hard to remove if allowed to congeal on the aluminium surfaces.

We do not recommend the use of additives which can actually cause harm if added to a bean (vegetable) oil.

Gearbox (Transmission)

Either Castrol R40 or Castrol Hypoy 90 are recommended for use in the gearbox but. as the latter is a mineral oil, the two must never be mixed.

To fill the gearbox, remove the filler and level plug (see *Fig. 32*) and pour in oil until it runs from the level hole. Allow the surplus oil to drain off and replace both plugs securely. It is a worthwhile precaution to wire both plugs for additional security. The oil level should be checked periodically and always when the machine is being prepared for an event. The oil should be changed every five or six races.

Chaincase

Mineral oil only of SAE5 or 10 is recommended for the chaincase. No oil level plug is provided thus when the oil is changed (at the same time as the gearbox oil is changed), 125 cc (5 fluid oz U.S.) should be added to achieve the correct level.

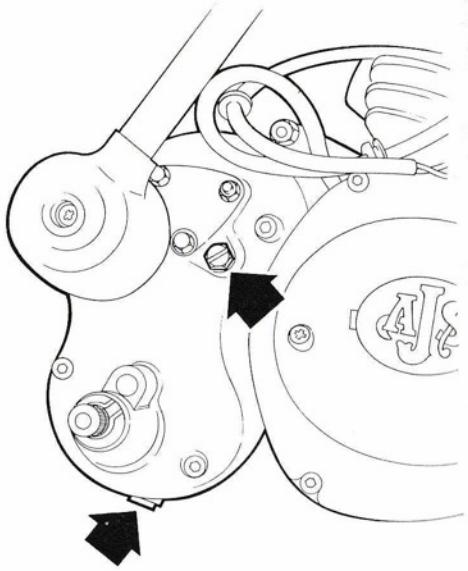


Fig. 32 Gearbox (Transmission) plugs— oil filler/level plug top and drain plug bottom.

GEARBOX (TRANSMISSION)

SECTION D

Gearbox (Transmission)

The gearbox of the Stormers is extremely rugged but at the same time simple to work on. The gearbox is available in either close or wide ratio condition – the ratios being indicated by the identification letters stamped on top of the gearbox shell forward of the filler plug. "WR" indicates Wide Ratio – "CR" indicates Close Ratio.

The Stormer gearbox can be dismantled in two different ways as described in Methods 1 and 2 to suit particular requirements. In *Fig. 33*, the clutch has been removed and it is thus more convenient to withdraw the gearbox cover with gear cluster attached (this operation is described in full as Method 1). In *Fig. 34*, the gearbox cover with the gearshift mechanism attached, is removed leaving the gear cluster and selector parts in the gearbox shell. This latter method (described in full as Method 2) is preferred if the primary transmission has not been removed, since this allows the mainshaft to be left in position. From the gearbox layout in *Fig. 35* it will be ascertained which particular method is more practicable for the operation to be undertaken. For convenience, if the gearbox is separated from the engine it should be mounted in a vise using a plate part number ST 5765.

Note: It is not necessary to remove the gearshift or kickstarter pedals during removal of the end cover by either of the following methods.

Removal of the power unit from the frame is covered in Section B1 and separation of the gearbox from the engine in Sections B1 to B4.

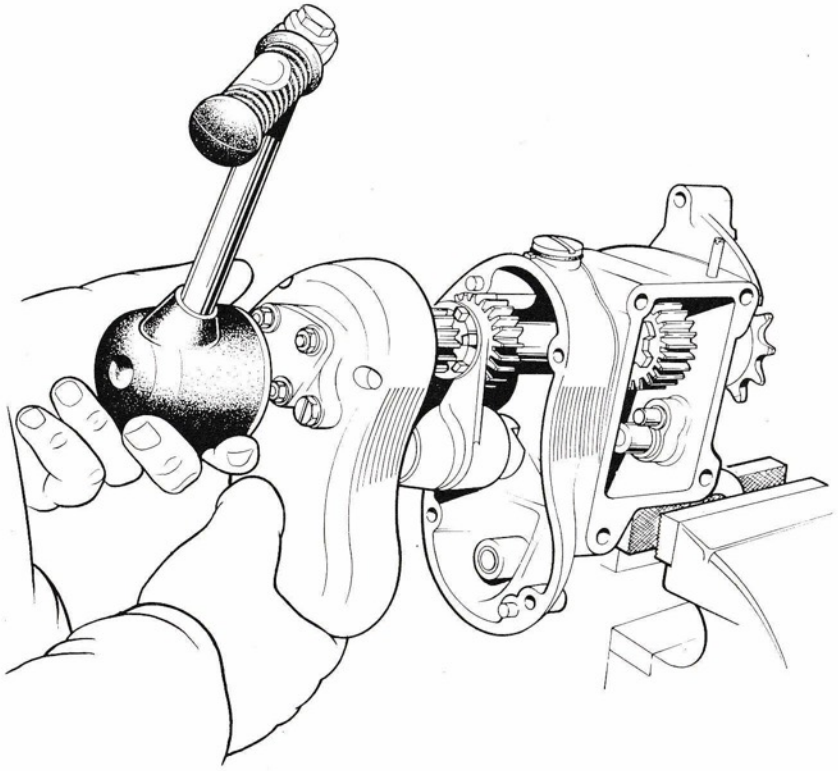


Fig. 33 Gearbox (Transmission) showing Method 1 dismantling procedure.

SECTION D1

Gearbox (Transmission) dismantling

Method 1. It is assumed that the clutch has been removed as in Section B3. Proceed as follows:

1 Remove the square section circlip from the mainshaft splines outboard of the mainshaft (countershaft) sprocket.

2 Remove the five socket screws.

3 Grasp the gearshift and kickstart pedals and ease away the cover, with gear cluster attached, from the gearbox shell. Gentle pressure on the end of the gearbox mainshaft will aid removal.

If the thrust washer between the mainshaft third gear and sleeve gear (that is the mainshaft high gear which is captive in the gearbox shell) has not come away with the cluster, collect it from the recess in the sleeve gear. Collect also the spacer washer from the layshaft.

The mainshaft remains captive on the gearbox cover.

4 The cam barrel and selector forks, mainshaft third gear pinion (the sliding pinion) and layshaft with pinions can now be lifted away from the cover.

5 Collect the thick and thin thrust washers from each side of the first gear pinion.

The remaining components may now be separated from the gearbox cover. For ease of handling, remove the gearbox shell from the vise and mount the gearbox cover, clamping onto the kickstart crank. Proceed as follows:

6 Take off the triangular mainshaft end cover (two set screws and one nut).

7 A Spiralox circlip secures the mainshaft. To remove take a pointed and slightly hooked implement (an old spoke, suitably ground and formed would be ideal), insert under the tail of the circlip and peel out anti-clockwise. (see *Fig. 40*)

8 Withdraw the mainshaft from the cover.

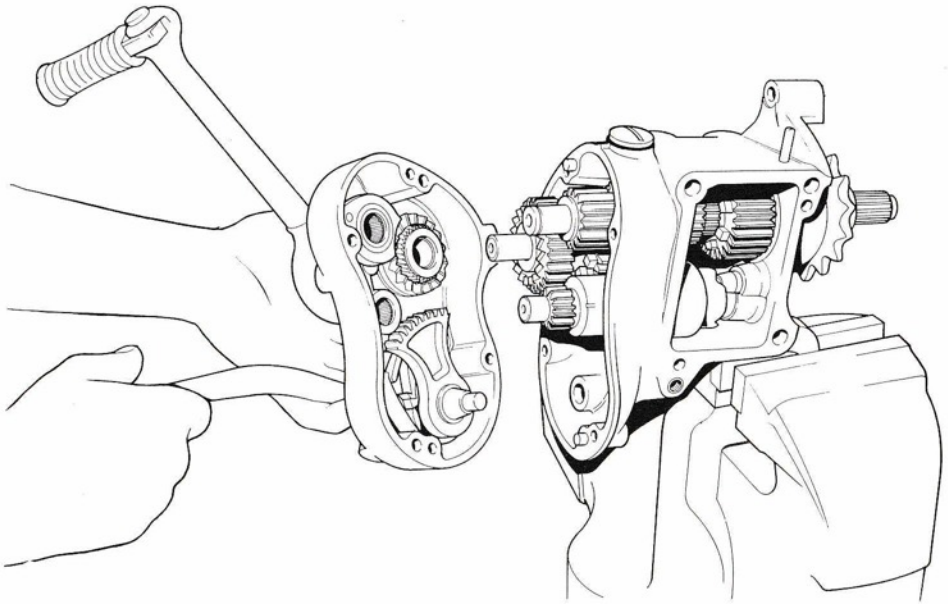


Fig. 34 Gearbox (Transmission) showing Method 2 dismantling procedure.

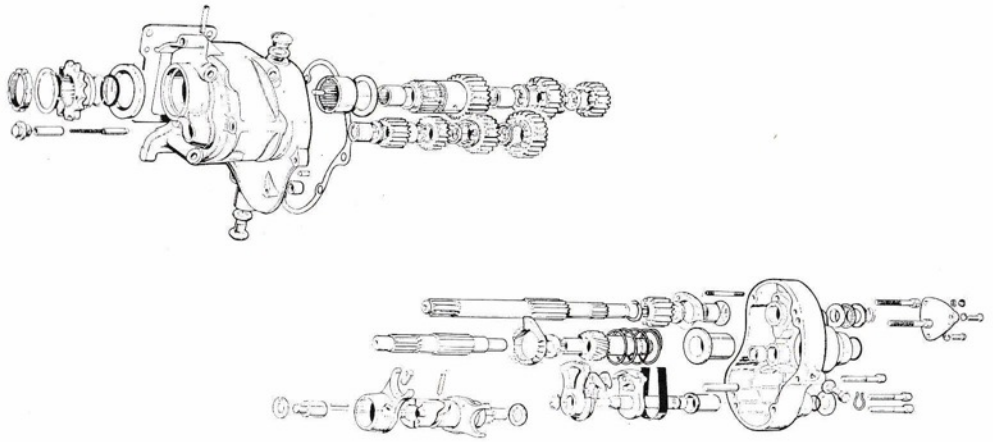


Fig. 35 Exploded view of complete gearbox (Transmission).

9 Collect the two plain thrust washers, thrust bearing and shims from the mainshaft bore in the cover.

10 From the mainshaft remove the thrust washer, low gear pinion, square section circlip, second gear pinion and thrust washer.

11 From the layshaft remove the loose pinions – only the third gear pinion remains captive – this is retained by a square section circlip.

To remove the sleeve gear it is necessary to take off the gearbox (countershaft) sprocket as in Section D5. When the sprocket has been removed, proceed as follows:

12 Remove the wire circlip from the sleeve gear spline with a sharp instrument and screwdriver.

13 Carefully remove the "O" ring which is fitted on the sleeve gear splines.

14 Withdraw the sleeve gear from the mainshaft bearing and collect the large thrust washer.

The gear quadrant and kickstart mechanism are covered separately in Sections D2 and D3.

Gearbox (Transmission) reassembly

Method 1

It is assumed that all components have been cleaned, inspected and renewed as necessary following Section D7. The order of assembly of the thrust washers is shown in *Fig. 36*.

The importance of correct end float on the gear cluster cannot be overstressed. The mainshaft end float figure can be checked: the layshaft end float figure cannot be checked, thus particular care is needed that the thrust washers are correctly located and that the thrust washers and thrust faces on the gearbox cover and shell are not worn severely. Proceed as follows:

1 Reassemble the gear quadrant and kickstart mechanism as detailed in Sections D2 and D3.

2 Reassemble the mainshaft gear cluster – slide thrust washer 25842 (see *Fig.* 36) onto the shaft followed by the second gear pinion, square section circlip (which must bed completely into the groove) low gear and thrust washers 25937 (·111 in.,–·110 in., i.e. 2·81 mm–2·80 mm).

3 Place the mainshaft through the needle roller bearing in the cover and refit the shims, inner thrust washer, thrust bearing and outer thrust washer.

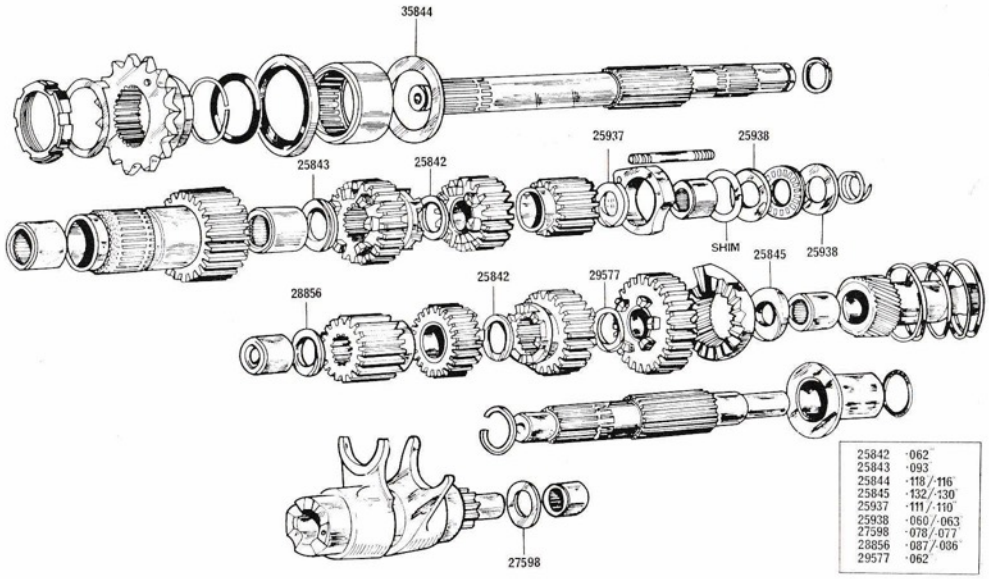


Fig. 36 Gear cluster indicating position and thickness of all thrust washers.

4 Fit the Spiralox circlip to the mainshaft. When fitting a circlip this must have the correct part number and be wound left hand. Unscrew the handle and sleeve from the body of the tool (see below), offer the circlip over the tapered end of the body and then reassemble the tool. Hold the recessed end of the body against the mainshaft and, pushing with the tool sleeve, slide the circlip over tool body and onto the mainshaft until it drops properly into position in the circlip groove see *Fig. 37*. The circlip should be checked finally to ensure that it has entered the groove through 360°.

5 The shaft must revolve freely with ·001/·004 in. end-float. Tightness or excessive end float must be rectified by adding or subtracting shims inboard of the thrust bearing inner thrust washer. At each stage the new circlip must be refitted for checking. Recheck until the end float is as above.

6 Apply jointing compound to the triangular plate and fit the plate, securing the two screws and nut.

7 Mount the gearbox cover in a vise, clamping on the kickstarter.

8 Smear the cam barrel thrust washer 27598 with grease and position over the needle roller bearing face.

9 Assemble the mainshaft third gear pinion to the mainshaft selector fork on the cam barrel (see *Fig. 39*).

10 Offer the mainshaft third gear pinion and cam barrel together to the gearbox cover and mainshaft – the third gear passes over the mainshaft as the cam barrel enters through the thrust washer 27598 into the needle roller bearing. At the same time the quadrant punch mark (by the third tooth) must be aligned with the scribe mark on the cam barrel (see *Fig. 39*).

11 Assemble thrust washer 25842 and the third gear pinion to the layshaft and secure with the square section wire circlip.

12 Place in position thrust washer 24845, layshaft low gear and thrust washer 29577.

13 Place in position layshaft second gear pinion and slide the layshaft longer end through the pinions – the shaft may need to be revolved with the fingers to engage in the needle roller bearing.

14 Assemble layshaft top (output) gear pinion and thrust washer 0710063 (·087 in.–·086 in. thickness, i.e. 2·22 mm–2·20 mm).

15 On the mainshaft, fit thrust washer 25843, the mainshaft sleeve gear pinion and large thrust washer 25844.

16 Check that the cluster revolves freely and fit the sleeve gear retaining circlip well into the groove.

Carefully remove the gearbox cover with cluster assembled from the vise ready to offer to the shell. The shell must be complete with bearings, bearing seal, cam barrel spigot, cam barrel index plunger and spring. Fix the clamping plate to the gearbox shell and mount in the vise. Lubricate the bushes and index plunger.

17 Recheck that the plunger and spring have not been displaced.

18 Ensure that the gearbox shell and gearbox cover joint faces are perfectly clean and apply a pliable jointing compound to the shell only.

19 Place the joint washer in position on the shell and check that both locating dowels are fitted.

20 Slide the gearbox shell over the gear cluster with the mainshaft sleeve gear passing through the sleeve gear bearing and oil seal.

21 Secure the shell to the cover (five screws).

22 Replace the "O" ring and wire circlip and ensure that this seats correctly.

23 Smear the gearbox (countershaft) sprocket boss with grease and fit the gearbox sprocket as in Section D5.

Gearbox dismantling

Method 2

This method assumes that the primary drive has not been removed, thus the gearbox mainshaft remains captive. The gearbox (transmission) may be dismantled in this manner equally well either in the frame, or on the bench, in which case the unit should be mounted in a vise. Proceed as follows:

1 Remove the triangular plate and gasket – secured by two set screws and one nut.

2 Remove the Spiralox circlip from the mainshaft – use a pointed and hooked instrument. Insert this under the tail of the circlip and peel off anti-clockwise.(see *Fig. 40*)

3 Remove the five socket screws holding the cover.

4 Prepare to catch thrust washers which may be displaced and pull the cover away gently so not to displace the gear pinions.

5 Collect the thrust washers for the layshaft, main shaft and cam barrel.

6 Remove the mainshaft low gear pinion, layshaft low gear pinion and inner thrust washer.

7 Remove the square section circlip from the mainshaft using a pointed instrument to lift and a thin screwdriver blade from behind.

8 Grasp the end of the layshaft and the end of the cam barrel and withdraw the cluster.

The mainshaft and mainshaft sleeve gear are captive in the gearbox shell and can now be separated for inspection. The gear quadrant and kickstart mechanism are covered separately in Sections D2 and D3.

Gearbox reassembly

Method 2

It is assumed that all components have been cleaned and inspected as in Section D7. See *Fig. 36* for the position of the washers.

The importance of correct end float on the gear cluster cannot be overstressed. The mainshaft end float can be checked: the layshaft end float cannot be checked, thus particular care is needed to ensure that the thrust washers are correctly located and that the thrust washers and thrust faces on the gearbox cover and shell are not worn severely. Proceed as follows:

1 Take the layshaft, assemble the thrust washer 25842, and third gear pinion and secure the square section circlip. Fit the high gear pinion, thrust washer 25843 (·087 in.–·086 in./2·22 mm–2·20 mm thickness) and second gear pinion.

2 Hold the mainshaft third gear pinion in position, check that the cam barrel spring and plunger are in position then offer the cluster into position, locating the cam barrel over the spigot and the layshaft into the bearing: push home as far as possible.

3 Slide thrust washer 25842 and second gear pinion onto the mainshaft and secure with the square section circlip.

4 Position the cam barrel in the bottom gear position.

5 To do this, turn the cam barrel until the timing scribe is at the 8 o'clock position (see *Fig. 39*) or alternatively turn the barrel clockwise to the limit of its movement and allow it to drop back as the index plunger locates.

6 Fit thrust washer 29577, layshaft low gear and outer thrust washer 25845.

7 Fit the mainshaft low gear and thrust washer 25937 (·111 in.–·110 in. thickness 2·81 mm–2·80 mm).

8 Using a smear of grease to retain it in position, fit thrust washer 27598 against the needle roller bearing in the cover.

9 Position the quadrant inside the cover to the low gear position – do this by lifting the gearshift lever the requisite number of times to ratchet the quadrant to the rearward position. (See *Fig. 38.*)

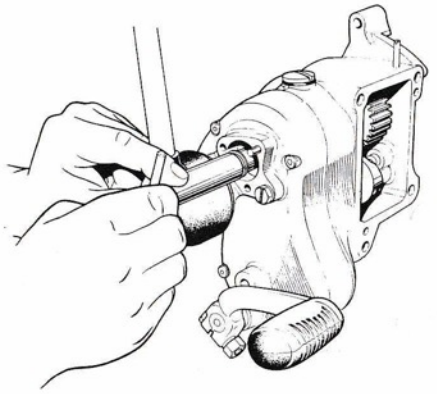


Fig. 37 Assembling Spiralox mainshaft circlip with service tool 0710069.

10 Clean the joint surfaces, apply jointing compound to the shell facing and place a new gasket in position on this facing.

11 Check both dowel pins are in position in the shell facing, then position and push home the gearbox cover. This may be made easier by moving the gearshift pedal *slightly* so that the teeth of the quadrant and cam barrel engage.

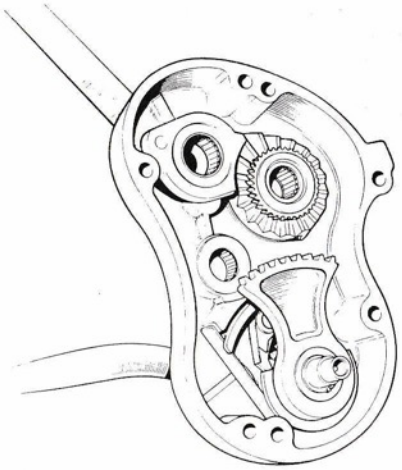


Fig. 38 Quadrant ratcheted to rearward position.

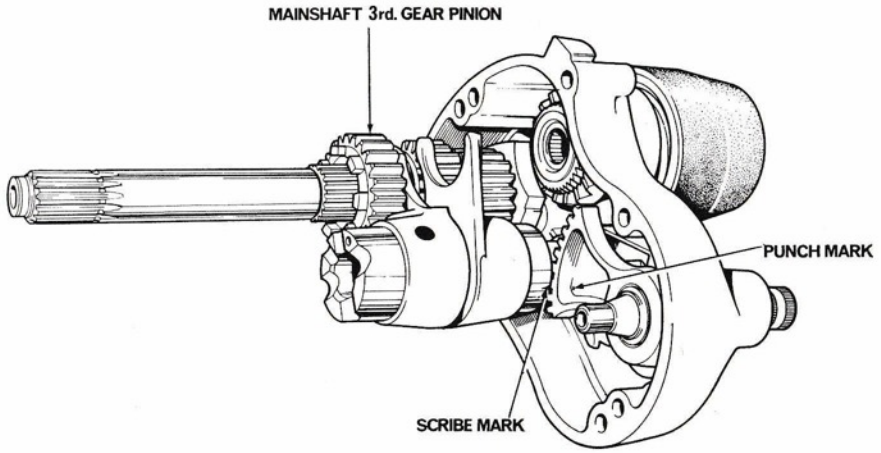


Fig. 39 Aligning punch mark on quadrant with scribe mark on cam barrel.

12 Check that all four gears can be selected by rotating the gearbox (countershaft) sprocket and mainshaft whilst moving the gearshift pedal.

13 Refit the mainshaft shims, inner thrust washer, thrust bearing and outer thrust washer.

14 Fit the Spiralox circlip using service tool 0710069. It may be necessary to apply pressure to the clutch end of the mainshaft by pressing the clutch spring plate through the clutch inspection window whilst the circlip is located. When fitting a circlip this must have the correct part number. Unscrew the handle and sleeve from the body of the tool, offer the circlip over the tapered end of the body and then reassemble the tool. Hold the recessed end of the body against the mainshaft and, pushing with the tool sleeve, slide the circlip over tool body onto the mainshaft until it drops properly into position in the circlip groove. (See *Fig. 37.*) The circlip should be checked finally to ensure that it has entered the groove through 360°.

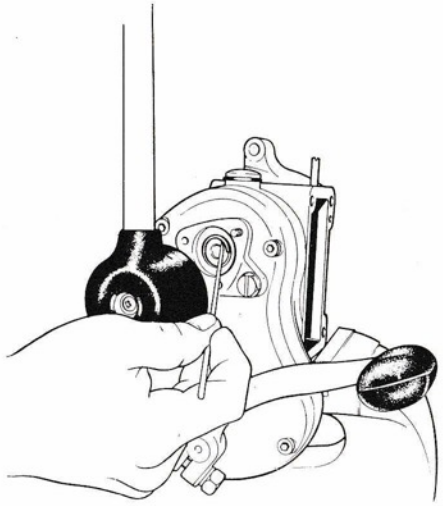


Fig. 40 Gearbox (Transmission) end cover showing Spiralox circlip removal.

See Fluff Brown's tips for gearbox end casing replacement here
See FAQ's #9

SECTION D2

Kickstart and external spring

The kickstart and external spring may be replaced equally simply whether or not the gearbox cover is fitted or separate from the shell. Proceed as follows:

1 Remove the kickstart shroud center screw and slide the shroud along the kickstart crank out of the way.

2 Remove the kickstart pinch bolt and nut, hold the spring cover tight to prevent it revolving against spring pressure and remove the kickstart.

3 Allow the cover to revolve gently and relieve the pressure on the spring then lift the cover and spring clear.

4 Position the kickstart return spring with the long tail away from the gearbox cover and place the cover loosely over it.

5 Position the kickstart on the end of the spindle splines, selecting the position to suit the rider's requirements.

6 Grasp the spring cover and rotate it to tension the spring and line up the spring end to the top hole in the kickstart, then push the cover home, fully securing with the pinch bolt and nut.

SECTION D3

Gearbox end cover dismantling

It is assumed that the end cover is already separated from the remainder of the gearbox (as in Section D1) Proceed as follows:

1 Slacken the gearshift pedal pinch bolt and lift the pedal clear.

2 Remove the kickstart, external spring and cover (see Section D2).

3 Remove the wire circlip and plain washer at the gearshift spindle.

4 Taking care not to damage it, remove the "O" ring which is located in the outboard end of the shaft boss.

5 The kickstart stop plate with stud is free to be removed – this will release the kickstart ratchet and spring.

6 Pull the selector assembly free of the gearbox cover and collect the "O" ring from the cover.

7 Dismantle the selector assembly – remove the circlip and lift the quadrant away from the gear-shift spindle. The two pawls, pawl retaining spring and larger gear control spring can now be separated.

SECTION D4

Gearbox end cover reassembly

The order of reassembly is as follows:

1 Fit the gearshift spindle to the outer cover and locate a new "O" ring over the shaft into the outside of the cover boss.

2 Replace the gearshift spindle washer and circlip and ensure the circlip is fully bedded into the correct groove.

3 Refit the gear control spring (see *Fig. 41*).

4 Fit the two pawls as in *Fig. 41* – the first one must have the long claw facing to the front of the gearbox. The second pawl has the long claw to the rear of the gearbox.

5 Insert the small pawl spring and place the quad-rant, ratchet side towards the pawls – secure with the retaining circlip.

6 Fit the kickstart stop plate in position.

7 Fit the kickstart spindle in the cover and locate a new "O" ring over the shaft into the outside of the cover boss.

8 Assemble the kickstart spring, cover and lever on any spline and tighten the pinch bolt. Refit the shroud and screw.

9 Rotate the kickstart and shaft anti-clockwise to its normal position. Inside the cover fit the ratchet coil spring and locate the ratchet onto the splines. Now allow the kickstart to return against spring pressure and the ratchet will abut to the stop plate, holding the ratchet assembled.

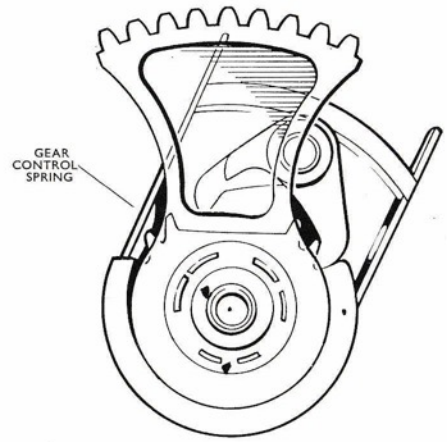


Fig. 41 Showing positioning of pawls and gear control spring relative to the quadrant.

SECTION D5

Changing the countershaft (gearbox) sprocket

To gain access to the countershaft sprocket it is necessary to remove the clutch and inner chaincase (see Sections B2, B3, B4). Then proceed as follows:

1 Tap back the tabs of the locking washer with a suitable instrument.

2 Lock the countershaft sprocket with a chain wrench, or old length of chain (see *Fig. 42*) if the unit is out of the frame, or leave the rear chain *in situ* and apply the rear brake if the unit is in the frame.

3 Slacken the castellated ring nut with a suitable "C" spanner and collect the ring nut, locking washer and sprocket.

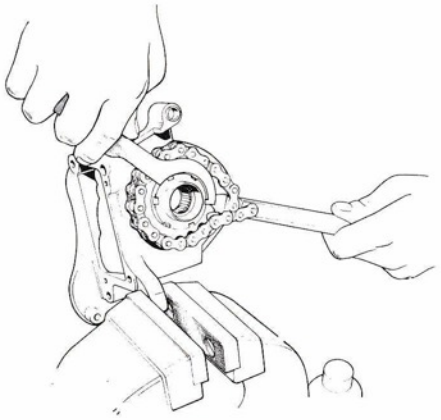


Fig. 42 Tapping lockwasher into castellations of countershaft sprocket lockring.

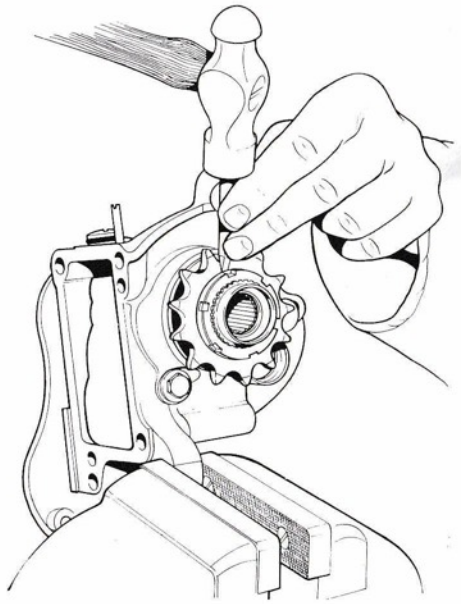


Fig. 43 Using a chain wrench to lock the countershaft sprocket.

4 To reassemble, place the sprocket in position followed by a *new* locking washer.

5 Fit the locking ring – if the tab to locate into the sprocket is not already formed, bend to shape with pliers then locate the tab in the sprocket.

6 Lock the sprocket with a chain wrench and tighten the lockring completely with a "C" spanner.

7 Peen the lockring into two of the lockring castellations using a center punch. (See *Fig. 43.*)

SECTION D6

Renewal of seals and bearings

After examination of gearbox (transmission) components (see Section D7) any worn or damaged parts should be replaced. Of the gearbox bearings only those in the shell and the mainshaft bearing in the cover are readily replaceable. The remaining bearings in the cover must not be disturbed.

Bearing and seal removal

During renewal of bearings in the shell, the oil seal must be removed first. The seal is usually destroyed during this operation, being prised out using a screwdriver blade. It is necessary to heat the gearbox shell, preferably in an oven, to a temperature of 100° to 120°C to facilitate removal. Use suitable sized drifts to drive out each bearing, taking special care not to damage the housings.

Removal of the mainshaft bearing from the gearbox cover requires a similar procedure.

Bearing and seal refitting

The gearbox shell must be fitted first with the sleeve gear bearing then the seal. Heat the gearbox shell (as during dismantling), enter the new sleeve gear bearing from either side and press home until the inner face of the bearing stands fractionally proud of the inner step (counterbore). Enter the layshaft needle roller bearing from inside the shell and press in until this also stands fractionally proud of the inner step.

Fit the oil seal over the sleeve gear bearing with the pressure (spring) side towards the bearing and tap fully home.

To fit the mainshaft bearing in the gearbox cover, heat the cover, preferably in an oven, to a temperature of 100°C to 120°C and tap the bearing home until the inner face of the bearing is flush with the inner surface of the housing.

SECTION D7

Examination of the gearbox (transmission) components

Thoroughly wash all parts in clean gasoline (petrol) and allow them to dry. Lay them out on a clean bench so that each part may be examined methodically. Check the peg upon which the gearchange pawls move, flats on the peg will cause faulty gear changing. The pawls should be free from "chipping" and their original form should be clearly defined. The pawl springs must be perfectly sound. Examine the teeth of the quadrant in which the pawls engage, if they are worn in any way a replacement should be fitted. The gear selector forks should show no signs of scuffing, blueing or wear and they should rotate round the cam barrel freely and smoothly.

If it should be found that the cam barrel stop peg is broken, we recommend that the latest improved cam barrel and selector fork assembly 0710075 be fitted. It is, however, possible, providing no serious damage has taken place on the selector forks and cam barrel to remove that broken peg and fit a new one, securing this by the use of Loctite AV grade sealant. This will necessitate degreasing thoroughly those parts to which Loctite will be applied.

The dogs on the faces of the mainshaft and layshaft pinions must be unworn, and there should be no evidence of chipping or rounded corners. Where a pinion is bushed, check the bush for wear and ensure that it is securely located in the pinion. The teeth of all the pinions must be unworn and undamaged.

Check the mainshaft and layshaft for wear, paying particular attention to the point where the thrust washers are located. Examine the needle roller bearings to ensure that they are in sound condition and have not moved in their housings. If they have to be removed, the component should be heated.

It is unlikely that the two mainshaft bearings inside the output sleeve gear or the kickstart shaft needle bearing will have worn, but if replacements are necessary, a suitable drift or press should be used to remove the old bearing and fit the replacement.

IGNITION TIMING

Whilst the engine is receiving workshop attention, a method of timing is recommended which ensures extreme accuracy. This method requires the use of a dial gauge, (such a tool can be purchased from a good tool stockist) and an ohmeter points checker or a battery and bulb check light, rather than the standard timing tool 0710057.

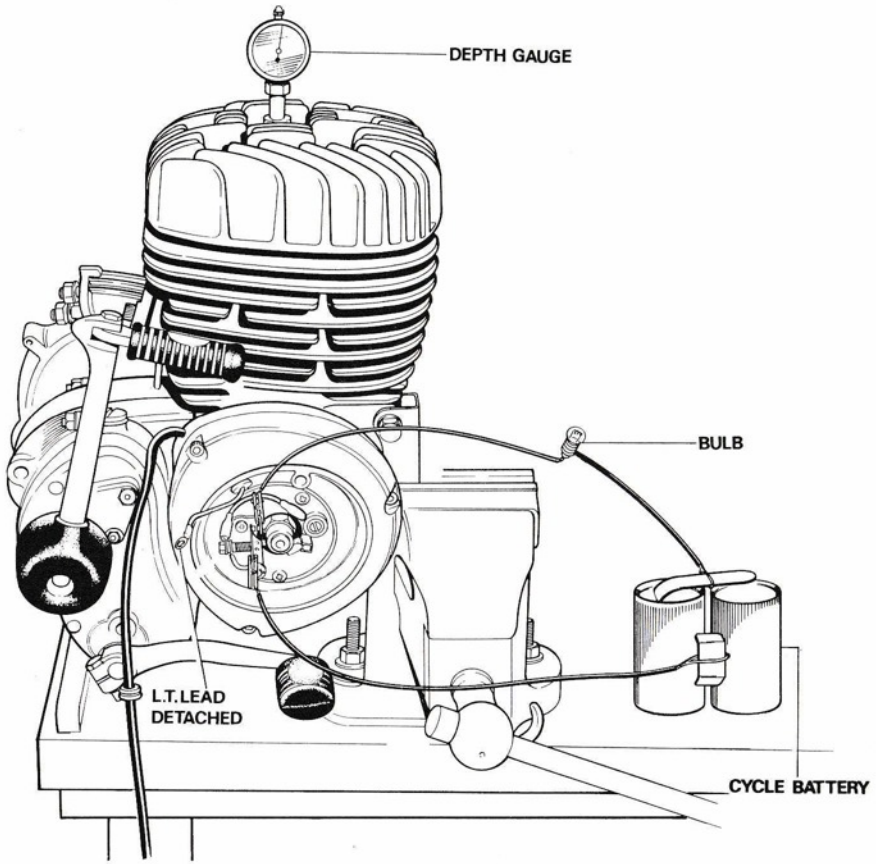


Fig. 44 Checking piston position using a dial gauge, also checking ignition timing with battery and timing light.

1 Screw a dial depth gauge into the spark plug hole.

2 Set the contact breaker points gap at ·015 in. to ·018 in. (·38 mm/·4572 mm).

3 Turn the engine to bring the piston to top dead centre (TDC) – this is indicated by the swing of the needle on the depth gauge (·125in./3·2mm. on 410) (see *Fig. 44*).

Turn the engine backwards to indicate ·100 in. (2·5 mm) on the depth gauge. This is the correct timing position. Detach the LT lead from the points.

4 Attach a battery and timing light – one lead to earth and one to the points as shown in *Fig. 44*.

5 *Just* slacken the timing plate screws and revolve the plate until the light extinguishes. Turn the plate anti-clockwise to advance and clockwise to retard. At the moment when the light extinguishes, timing is correct and the three screws should be locked.

Note: If the LT lead is not disconnected, at the correct timing point the bulb would dim and not extinguish.

6 Reconnect the LT lead to the fixed point.

7 If the cover plate has been removed especially for timing purposes, it should be refitted at this stage.

CARBURETOR

Carburetor

The Amal concentric float carburetor proportions and atomises the correct amount of fuel mixing it with the air drawn in through the air intake. The jet sizes, choke bore, throttle needle, and throttle slide cut away ensure that the correct fuel/air mixture is maintained at all throttle openings.

Initial opening of the throttle brings into operation the mixture supply from the pilot jet system which controls the idling speed. As the throttle is progressively opened the mixture supply is augmented from the main jet which discharges through the needle jet into the primary air chamber and goes from there as a rich fuel/air mixture through the primary air choke into the main choke. The earlier stages of the throttle opening are controlled by the throttle cut away and the taper needle which passes through the needle jet, the taper allowing more fuel to pass through the needle jet as the throttle is opened.

The carburetor used on the 370 cc/410 cc models is of the type 1000, whereas that on the 250 cc models is of the type 900. The instruments are similar except in cross bore size and the following instructions apply equally to both types. The carburetor is shown in exploded form with part descriptions in *Fig. 45* below.

The air filter is covered in section K8.

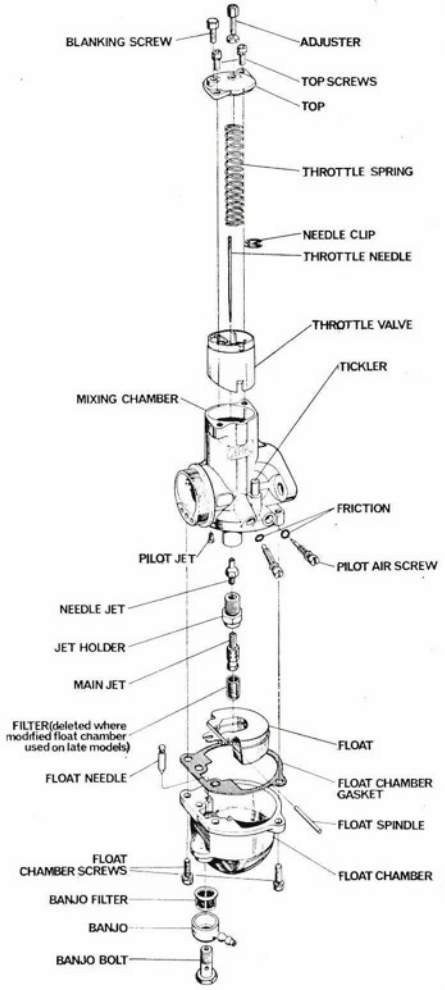


Fig. 45 Amal concentric float carburetor.

SECTION F1

Dismantling for cleaning

It is necessary to remove the carburetor for cleaning purposes. For simplicity disconnect the fuel line at the top, slacken the carburetor two manifold nuts and slide the air hose away from the airbox. Now remove the two socket screws and fan disc washers securing the manifold to the cylinder. The carburetor can now be pulled clear with the air hose attached. Proceed as follows:

1 Support the carburetor in one hand and remove the two screws securing the mixing chamber top, allowing the throttle slide, throttle needle and throttle valve to be withdrawn attached to the throttle cable.

2 The throttle needle is held captive to the slide by the throttle return spring and needle clip. Lift the spring (note for reassembly the groove engaged by the clip) then remove the clip and collect the needle.

3 Disengage the throttle cable nipple from the throttle valve.

4 Remove the two screws securing the float chamber to the carburetor body and collect the float chamber complete with float and float needle, also the joint washer.

5 The float and float needle are manufactured from white nylon. Lift the float, float needle and float spindle clear for later examination and drain the float chamber.

6 Remove the main jet, needle jet and pilot jet.

Examination – The following parts should be examined and replacements made where necessary:

Float – Check for leakage – fuel can be seen in the float if this condition exists. Check also that the float needle fits securely.

Float Needle – Check for wear on the seating taper.

Main Needle Pilot Jets – Examine for damage and blockage – never use wire to clear a blockage but instead use compressed air.

Throttle Valve – Remove any burrs and burnish carefully any scores. Deep scoring renders the valve unfit for re-use.

Throttle Needle – Ensure the needle is not bent or worn badly on the taper. Check that the clip grooves are clear and "sharp".

Carburetor Body – Blow out all internal galleries with compressed air. Check that all threads are sound. Examine for excess wear on the throttle valve bore.

Pilot Air Screw – Check for wear on the taper.

Reassembly – Assuming all parts are clean and in sound condition, commence reassembly as follows:

7 Using new friction "O" rings on both, refit the pilot air screw and throttle stop screw.

8 Fit the needle jet to the jet holder and jet holder to the carburetor body.

9 Fit the main jet and pilot jet.

10 Position the float, with float needle and spindle, in the float bowl.

11 Fit a new float bowl joint washer ensuring it is the correct way round with the holes aligned to the jet passages in the bowl.

12 Fit the complete float bowl and secure with the two screws and washers.

13 Assemble the needle clip to the needle – use the same position noted during dismantling.

14 Position the needle and needle clip in the throttle valve.

15 Pass the throttle cable through the mixing chamber top and throttle return spring and engage the nipple in the throttle valve. Ensure that the spring fits over the needle clip.

16 Slide the throttle valve into the carburetor body (with the cutaway towards the intake) engaging the needle through the needle jet and aligning the throttle valve with the keyway.

17 After checking that the throttle spring is located over the abutment inside the mixing chamber top, push the top down against the spring and secure with the two screws and washers.

18 Mate the carburetor to the manifold with the nuts and washers loosely assembled.

19 Engage the air hose to the air box then secure the manifold to the cylinder with two socket screws and fan disc washers.

20 Tighten the carburetor holding nuts and the air hose clip.

21 Connect the fuel line to the tap.

22 Adjust carburation (see Section F3).

SECTION F2

Fuel tap

A non-reserve tap is used. This is fitted on the right side of the tank. When the lever is downwards, fuel flows to the carburetor by gravity. The tap should always be turned to the "off" (horizontal) position when the engine is stopped.

SECTION F3

Carburetor adjustment

Adjustment should be carried out in the sequence described below with the engine at operating temperature. The exhaust system to be used must be fitted and preferably the test should be carried out on a slight up grade so that the engine is pulling. (See *Fig. 46.*)

1 Main jet – Throttle ¾ to full open.

If at full throttle, the engine runs "heavily" with a tendency to "four stroke" or "burble" the main jet is set too large. If by slightly closing the throttle valve, the engine power seems to improve, the main jet is too small. With a main jet of the correct size the engine should run evenly, and be delivering maximum power at full throttle.

The appearance of the spark plug is one of the best indications of mixture strength. To check, run the machine at full throttle over the test course, declutching and stopping the engine quickly. Then examine the spark plug. If the plug has a cool appearance with the central insulator free from loose black carbon, the mixture is correct. A rich mixture will be indicated by a black, wet oily appearance with deposits on the central insulator. Weak mixture will be indicated by a dry whitish deposit and the points may appear to have been overheated.

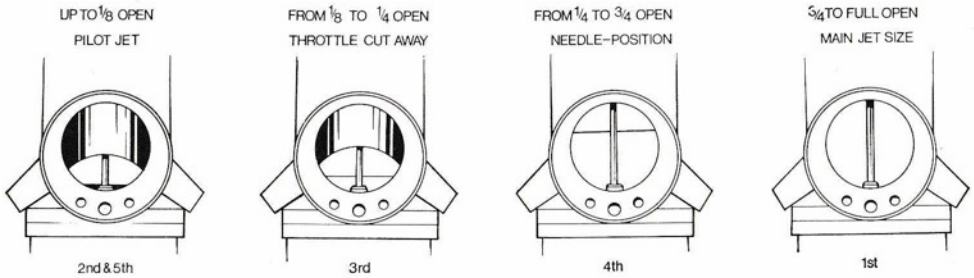


Fig. 46 Carburetor tuning sequence.

2 The pilot jet – Throttle up to ⅛ open.

Set the engine to run at a fast idling speed with the throttle shut by using the throttle adjusting screw. Screw this screw outwards until the engine runs slower and begins to falter, then screw the pilot air adjusting screw in or out to make the engine run more evenly and faster. If the idling speed is still too fast reduce it by means of the throttle adjusting screw and again adjust the pilot air adjusting screw until the idling is satisfactory.

3 Throttle cutaway – Throttle ⅛ to ¼ open.

If, as the machine pulls away from the idling positon, there is spitting back from the carburetor, slightly richen the mixture by screwing in the pilot air adjusting screw slightly. If this is not effective, return the screw to its former position and fit a throttle slide with a smaller cutaway. If, with the the throttle in this position, the engine jerks under load and there is no spitting, either the jet needle is much too high or a throttle slide with a larger cutaway is required to cure richness.

4 Throttle needle – Throttle ¼ to ¾ open.

The needle controls a wide range of throttle opening and therefore the acceleration. Placing the needle in the lower position, that is, with the clip in the top groove gives a weaker mixture. Placing the needle in the higher position, that is, with the clip in the bottom groove, richens the mixture. If the mixture is too rich with the needle in the lower position, the needle jet should be replaced and if the needle itself has had a great deal of use replace it also.

5 Pilot jet

Check again pilot adjustment as the last operation.

SECTION F4

Adjustment for altitude

Increased altitude tends to produce a rich mixture. The greater the altitude the weaker the mixture required. As supplied by the factory, carburetors on Stormer models are adjusted for altitudes up to 3000 ft. approximately.

Motorcycles operated constantly at altitudes between 3000 and 6000 ft. should have a reduction in main jet size of 5 per cent approximately and thereafter for every 3000 ft. in excess of 6000 ft. altitude, further reductions of 4 per cent approximately should be made. In addition to main jet adjustment, the throttle needle may need to be lowered during altitude correction.

FRONT FORKS

SECTION G1

Removing the fork assembly

The fork assembly should be dismantled by removing the wheel, fender and handlebars and then removing each fork leg assembly whilst leaving the top and bottom yokes assembled to the frame. The full procedure is detailed below:

1 Remove the front wheel (see Section H1).

2 Disconnect the throttle cable from the twistgrip.

3 Disconnect the clutch and front brake cables from the handlebar controls.

4 Remove two bolts from beneath the fork top lug to release the handlebar clamps. Lift away the handlebar complete with clamps.

5 Remove the front number plate – take off the "O" rings and spring the clips free of the fork main tubes. (Pre 1971 models have the plate secured by bolts, nuts and steel strip brackets.)

6 Remove the front fender (see Section K14).

7 Remove the chrome top nuts from the main tubes (spanner size $\frac{7}{8}$ in. Whit.).

8 Slacken the pinch bolts on the top and bottom yokes (see *Fig. 47*).

9 Grasp each fork leg in turn and pull downwards clear of the yokes. *Note:* the fork legs contain oil which must be drained off at this stage into a suitable container.

If desired, the fork can be removed at this stage. Remove as follows:

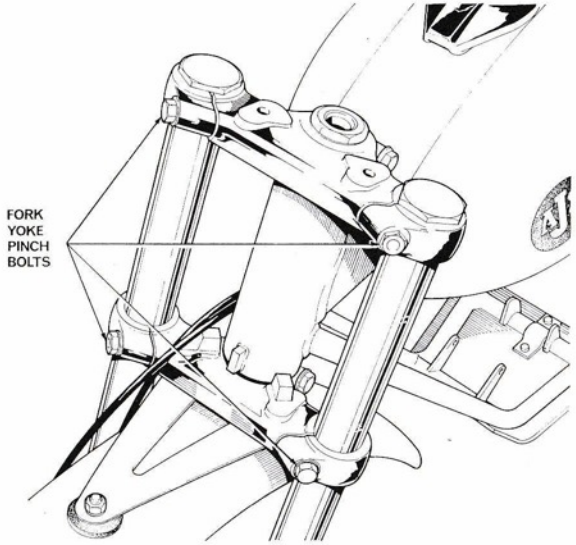


Fig. 47 Fork yoke pinch bolts.

10 Remove the stem top nut (spanner size $\frac{3}{4}$ in. Whit.) and using a hide hammer first on the top of the stem and then on the lower yoke, drive the yoke and stem clear of the steering head bearings. The top and bottom yokes can now be lifted clear of the steering bearings and the top and bottom spacers and top dust cover collected.

11 If for any reason the stem is to be removed from the lower yoke, slacken the pinch bolt, prise out the circlip and tap the stem out of the yoke with a soft drift.

SECTION G2

Refitting the fork assembly

To refit the fork assembly, assemble the yokes in the frame steering head bearings, then fit the legs, front fender and wheel and lastly the handlebars. Final tightening of the stem nut, main tube chrome top nuts and pinch bolts should be carried out as the last operation. The assembly procedure is given in detail below:

1 Press or drive the fork stem into the bottom yoke with a hide hammer and when fully home fit the circlip.

2 Locate the bottom spacer over the stem.

3 Using a hide hammer on the bottom yoke, tap the stem home through the steering head bearings.

4 Place the dished dust cover lip downwards over the top steering head bearing followed by the top spacer.

5 Place the top yoke over the stem and fit the washer and nut. Tighten the nut sufficiently to pull the stem well through the top yoke but do not tighten up solid.

Add $7\frac{1}{2}$ fl. oz. (210 cc) of the recommended oil to each fork leg as it is fitted to the yokes. Pass each assembled fork leg through the lower yoke, then the upper yoke and secure (but do not lock up) the top chrome nuts.

6 Refit the front fender (Section K14).

7 Refit the front wheel (Section H1).

8 Refit the handlebars complete with clamps by fitting and securing the bolts from beneath the top yoke.

9 Finally lock up the six pinch bolts, cap nuts and stem nut.

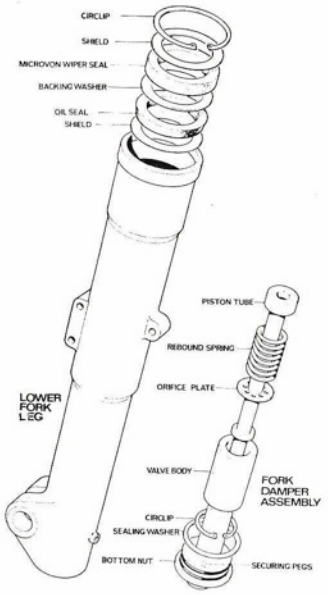


Fig. 48 Order of assembly of fork damper and fork lower leg.

SECTION G3

Dismantling and reassembling a fork leg

The fork legs both dismantle in the same manner. After removal of the bottom nut, the complete main tube and damper assembly are slid down clear of the lower fork leg. The damper assembly is then parted from the main tube. It should be noted that the lower fork leg bushes are line bored on production and cannot be renewed outside the factory.

The dismantling and reassembly procedure for each leg is as follows:

1 Lift clear the main spring and top spring spacer (if fitted).

2 Slide the plastic gaiter along the main tube out of the way.

3 Before stripping, relieve any rough areas on the main tube which could damage the oil seals.

4 Remove the steel bottom nut. (A tommy bar is necessary at this point.)

5 Withdraw the main tube and damper assembly from the bottom of the lower fork leg.

6 Using inside circlip pliers remove the circlip from the bottom of the main tube and remove the damper assembly.

At this stage examine the main tube for bending and for deep scoring and replace if necessary. It is neither necessary nor desirable to dismantle the damper assembly unless there is evidence of damage though it would be advantageous to check the order of assembly shown in *Fig. 48*. Make sure that the damper valve is fitted the right way round, that is, small diameter uppermost, and check that the peg securing the fork bottom nut is quite secure. If necessary, drive out the peg with a slender drift to dismantle the damper assembly – a new peg must always be fitted on reassembly. The lower fork leg contains both a microvon seal and single lip seal (see *Fig. 48*). Dismantling should proceed as follows:

7 Using inside circlip pliers, remove the top circlip and lift out the shield, microvon dirt seal, and backing washer.

8 Prise out the garter-type oil seal, taking great care not to damage the top of the lower fork leg in the area of the circlip groove.

9 Lift out the oil seal backing washer.

To reassemble the lower fork leg, support it vertically and proceed as follows:

10 Place the oil seal backing washer in place.

11 Tap the new oil seal, spring side downwards, fully home into the leg – make sure the seal is entered squarely to the leg.

12 Place in position the top seal backing washer, microvon dirt seal and shield.

13 Fit the retaining circlip with inside circlip pliers and check that it is bedded all round.

14 Support the lower fork leg vertical and enter the main tube, without damper, from the top, to avoid seal damage.

15 Enter the complete damper assembly (which was checked during dismantling) vertically into the fork main tube so that the spring does not tilt and sprag. Check that the circlip groove in the tube is clean and undamaged and secure with the inside circlip which must be bedded all round.

16 Smear jointing compound on the bottom nut facing and threads, screw home the nut and tighten with a tommy bar.

17 Place the fork spring in the main tube. With the softer rate springs used in some markets, a spacer is used on top of each spring and should be placed in position at this stage.

SECTION G4

Steering head bearings

Both bearings are of the pre-packed and greased sealed ball type (see *Fig. 49*) which require no further greasing during their life. However, after very considerable use it may be necessary to replace the bearings as follows:

1 Remove the complete fork assembly (see Section G1).

2 Remove the circlip retaining the bottom bearing.

3 Using a long drift down through the steering head tube, tap the bearing a little at a time. Very little of the bearing stands proud and the drift must be used with extreme care.

4 Tap out the top bearing using the drift through the steering head tube from below – again exercise great care and tap round the lip of the bearing a little at a time. At this stage remove the bearing spacer tube.

During reassembly, degrease the housing and outer race of the bearings and and apply Loctite A.V. grade to prevent any possible movement in the housing.

The order of assembly is shown in *Fig. 49*.

5 Tap the bottom bearing into the steering head tube of the frame sufficiently to fit the circlip fully.

6 Using a long drift through the steering head tube of the frame, tap the bottom bearing all round to ensure that it abuts to the circlip.

7 Place the bearing spacer tube in position.

8 Tap the top bearing squarely into position until it abuts to the spacer tube.

9 Refit the fork assembly (section G2).

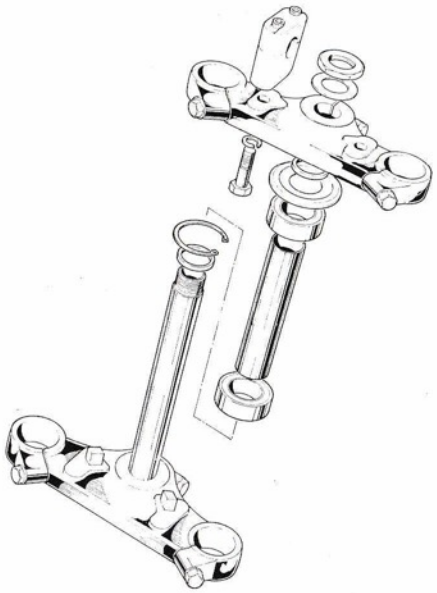


Fig. 49 Order of assembly-steering head bearings.

WHEELS

Wheels

No center stand is fitted to the Stormer motorcycles and during removal of either wheel, it is necessary to support the bottom tubes of the frame on a stout box or stand.

The brake components are generally interchangeable though the pivot pin is assembled on opposite sides of the brake plate. The brake plates are fitted with a unique "piston ring" sealing arrangement.

A similar order of assembly of wheel bearings is used in both hubs. Hi-tensile alloy wheel rims are used on late models and it is recommended that the spokes be retensioned after two meetings.

SECTION H1

Front wheel – removal and refitting

Proceed as follows:

1 Disconnect the front brake cable at the brake arm.

2 Remove the single bolt and washer securing the torque arm to the brake plate.

3 Remove the axle nut and washer.

4 Slacken the four axle clamping bolts.

5 Insert a tommy bar through the drilling at the left end of the axle and pull the axle out (see *Fig. 50*). If the axle proves rather tight, it can be tapped loose with a hide hammer or a soft drift.

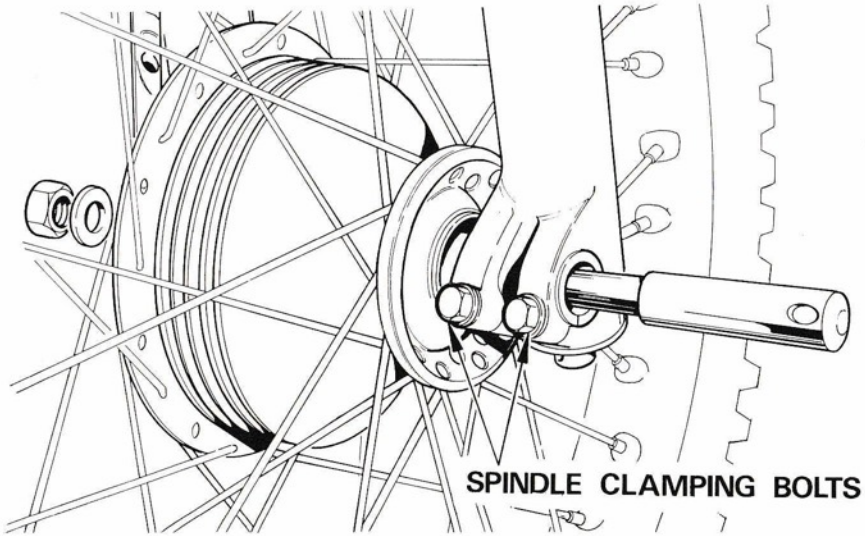


Fig. 50 Removing the front wheel axle.

6 To refit the wheel, wipe the axle clean and grease lightly.

7 Push in the axle: fit and tighten the axle washer and nut.

8 Leave the four socket screws slack at this stage then apply the front brake fully and pump the forks up and down a few times to centralise the fork legs on the axle.

9 Ensure the shims are fitted in the sawcuts at each axle clamp on the fork leg and tighten completely the fork end socket screws.

10 Secure the torque arm to the brake plate.

11 Reconnect the front brake cable and adjust.

SECTION H2

Rear wheel – removal and refitting

1 Disconnect the rear chain at the split link.

2 Remove the bolt securing the torque arm to the brake plate.

3 Remove the rear brake rod adjuster nut and depress the brake pedal to disengage the rod from the cam lever.

4 Remove only one of the rear axle nuts and push or soft-drift the axle out from the opposite end.

5 Collect the spacer which fits between the right end of the hub and the swinging fork, also the large washer from between the brake plate and swinging fork, and remove the complete wheel.

Refitting of the wheel is a direct reversal of the removal procedure but there are several points of importance to note, thus the full procedure follows:

6 Ensure that if the brake plate has been disturbed, the piston ring seal is fully engaged in the hub before the wheel is refitted in the swinging arm – the ring can be fed in carefully with a screwdriver blade if necessary.

7 Position the wheel in the swinging arm but resting on the ground.

8 Lift the wheel into position and start to enter the axle which should be clean and lightly greased. The axle may be fitted from either end but the recommended method is to pass the axle through the right side of the swinging arm sufficiently to allow the spacer to be placed over the axle. Push the axle through the spacer and hub but leave room to locate the large washer over the brake plate. The axle can then be pushed fully through the hub, washer and left side of the swinging arm.

9 Refit and tighten the axle washer and nut.

10 Refit and tighten the bolt and washer securing the torque arm to the brake plate. On models prior to the bolt-on chain guide, if the torque arm has been removed, ensure that the forward end of the torque arm is fitted inside the lug on the swinging arm and also that the chain lies centrally in relation to the chain guide.

11 Join the ends of the rear chain over the rear wheel sprocket and fit the master (split) link. This link must be fitted with the closed end of the link facing forwards on the top run of the chain.

12 Feed the rear brake rod through the brake arm trunnion. Fit the adjuster nut and adjust the brake as required.

SECTION H3

Wheel bearings

The order of assembly of the bearings is similar for both wheels and is illustrated in *Fig. 51*. Note that the bearing on the opposite side from the brake is located by a circlip at both sides. After removing the wheel from the motorcycle (see Section H for the front wheel or H2 for the rear wheel) proceed as follows:

1 Lift the brake plate out with shoes attached. Store with care so that the piston ring seal is not damaged.

2 Using circlip pliers, remove the outer circlip and collect the bearing shroud.

3 Working from the other side of the hub, force the spacer over sideways, then use a long drift and hammer to tap out the bearing.

4 Do not disturb the inner circlip but lift the bearing spacer out using long-nose pliers.

5 Again using the drift, from the other side of the hub, tap out the second bearing.

At this stage check both bearings for roughness, obvious wear or damage to the bearing lubricant seals. The bearings are both of the pre-packed and sealed type. Replace the bearings if necessary. To reassemble proceed as follows:

6 Tap the bearing into the hub to abut to the inner circlip.

7 Fit the bearing shroud, lip towards the bearing, fit the outer circlip and ensure that it is well bedded in the groove.

8 From the other end of the hub place in the bearing spacer.

9 Fit the second bearing and ensure that it abuts evenly to the spacer tube.

10 Refit the brake assembly. This will necessitate guiding the piston ring seal into the hub using a screwdriver blade since forcing may fracture the ring.

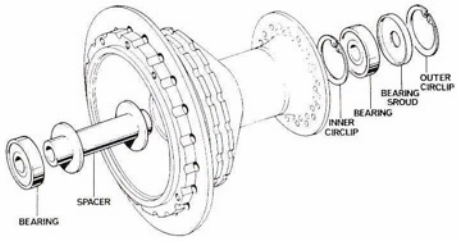


Fig. 51 Order of assembly of wheel bearings.

SECTION H4

Changing the brake shoes

The four brake shoes are completely interchangeable. We recommend that, when the brake linings become worn, new shoes with factory linings should be used or alternatively the shoes be relined by a brake lining specialist. The factory does not supply brake linings only as spares for the reason that re-lining is a specialist operation and the linings properly should be ground after riveting to the shoes.

The simplest method of removing the brake shoes is to remove the brake operating arm after removal of the nut and washer. The brake cam can now be pushed out between the shoes (see *Fig. 52*) and the shoe spring pressure relieved. It is now simple to lift both shoes and springs away from the pivot pin as a set (see *Fig. 53*). Remove any corrosion from the brake cam and grease lightly.

To reassemble, note that the pair of brake shoes with springs should be offered to the pivot pin as a set. The springs should be fitted with the open end of the springs away from the brake plate. Lightly grease the tongued ends of the brake shoes, engage on the pivot pin then force the shoes apart sufficiently for the brake cam to be refitted. Finally refit the brake cam lever, washer and self locking nut and the brake is ready to refit into the wheel.

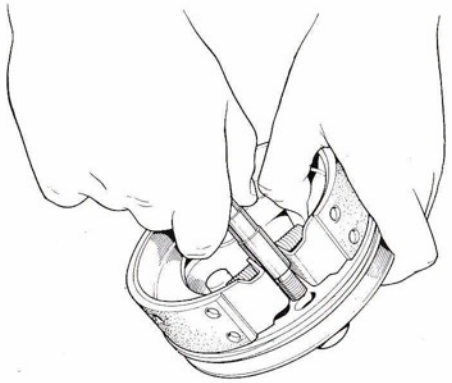


Fig. 52 Brake cam removal.

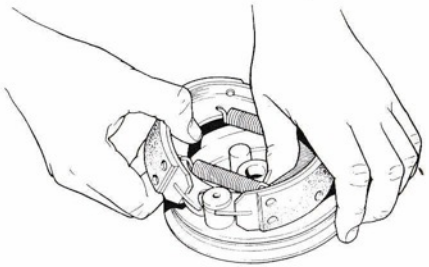


Fig. 53 Lifting brake shoes clear of pivot pin.

SECTION J2

Tire refitting

1 Ensure the rubber rim tape is fitted, rough side towards the rim and central in the well with the valve hole aligned with the piercing.

2 Lubricate with soapy water and fit the first bead of the tire to the rim without the tube, (see *Fig. 57*) starting at the valve hole and working round a little at a time, if necessary using a tire lever for the last few inches (see *Fig. 58*).

3 Loosely assemble the security bolts to the rim with the nuts on the end thread only (see *Fig. 59*).

4 Replace the valve core and inflate the tube just sufficiently to cause stretch.

5 Dust the tube with French chalk and insert into the tire casing.

6 Ensure that the first bead fits as far as possible into the well of the rim and, starting opposite the valve, insert a tire lever as close as possible to the point where the bead passes over the flange. Lever the bead over the rim, working round in 3 to 4 in. intervals and checking continually that the security bolts are pressed well inside the tire (see *Fig. 60*) so that the tube is not nipped.

7 Fit the valve knurled nut and inflate the tire.

8 To seat the security bolts correctly in the tire, bounce the tire several times at each security bolt checking that the bead line is concentric to the rim then nip up the security bolt nuts – overtightening will split the leather washers.

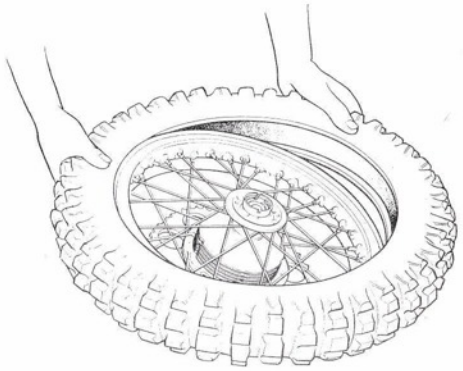


Fig. 57 Fitting the first bead to the tire without the tube.

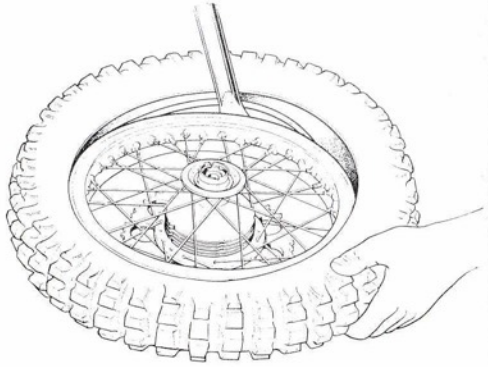


Fig. 58 Fitting the first bead over the rim.

Tire fitting without the use of tire levers

Some riders prefer to refit tires without the use of tire levers so that any possibility of damage to the rim is eliminated. The use of a proprietary tire lubricant or soapy water is essential.

The general fitting procedure is as detailed in Section J2 "Tire Fitting" with the following differences.

After fitting the rim tape, but not the security bolts, lubricate the tire bead thoroughly. Lay the wheel on the ground on a clean surface so that dirt cannot enter the hub. Lay the lubricated tire on the rim, then tread the tire over the rim with the heel a little at a time until the first bead is in place. As in Section J2 security bolts should be fitted loosely and the tube inflated partially. Lubricate the second bead including the inside edge and push the security bolts well into the rim. Start fitting the second bead by treading it over the rim opposite the valve. Now work round the rim a little at a time to finish at the valve. Do not be afraid to tread the tire bead very hard over the rim. This will be necessary at the final stage at the valve position but providing the bead is lubricated adequately and providing only hee pressure is used, the bead will not suffer any damage.

When the tire is fitted, inflate fully and nip up the security bolts – overtightening will split the leather washers.

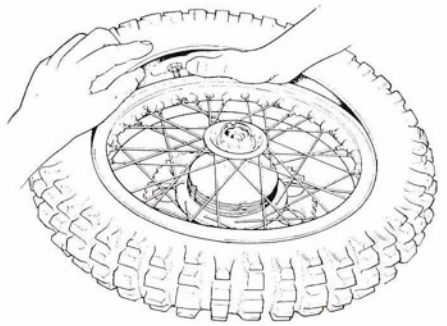


Fig. 59 Placing the security bolt in position.

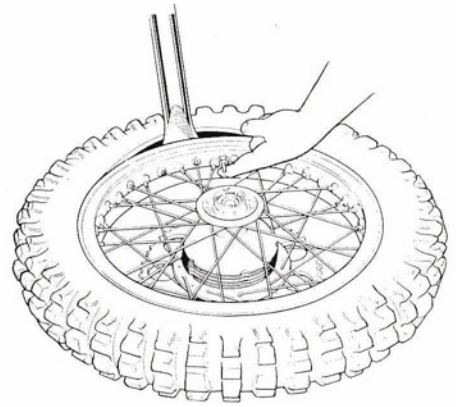


Fig. 60 Refitting the second bead with the security bolt in position.

FRAME AND ASSOCIATED FITTINGS

SECTION K1

Suspension units

The suspension units incorporate sealed rod-damper units and external springs. The damper units require no attention other than a periodic check to ensure that the damper rods are not bent, particularly if the motorcycle has been dropped heavily or has been in a collision.

Remove and dismantle as below:

1 Support the bottom tubes of the frame on a stout box or stand with the rear wheel clear of the ground.

2 Remove the suspension unit bottom bolt and collect nut and washer.

3 Remove the suspension unit top bolt and collect the spacer which fits between the frame and seat bracket.

CAUTION: If both suspension units are removed, the swinging arm with wheel attached, will drop down as the second unit is released.

If the springs are to be removed, mount each suspension unit in a vice in turn, clamping on the bottom mounting eye. Grasp the spring with both hands and have a second operator lift the split collars clear. The spring is now free and can be lifted clear to examine the damper rod. Work the damper rod up and down. After two or three movements, resistance should be felt to movement of the rod – if not, the damper unit is in need of replacement.

Reassembly and refitting instructions are a straight reversal of the above.

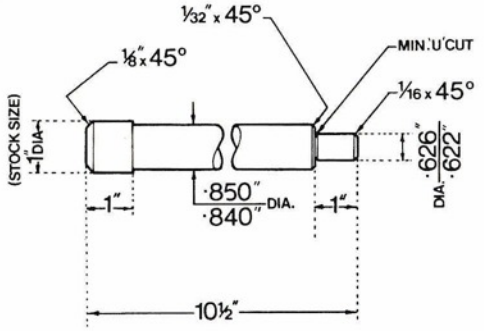


Fig. 61 Dimensions for making up swinging arm bush sleeve drift.

SECTION K2

Swinging arm removal

The swinging arm is mounted on composite nylon and steel bushes. Only after considerable use do the bushes require replacement and they require no greasing or other lubrication. A steel center sleeve passes through the full width of the swinging arm and stands just proud of the nylon bushes. The pivot bolt passes through the center sleeve and locks together the nylon and steel bushes, the center sleeve and frame side plates. The pivot acts between the nylon and steel areas of the composite bushes.

Removal is as follows:

1 Remove the rear wheel (see Section H2).

2 Remove the suspension unit bottom bolts and lower the free end of the swinging arm clear of the units.

3 Remove the side adjuster plate self locking nuts and washers.

4 Remove the nut from the right hand end of the swinging arm pivot bolt.

5 Support the swinging arm and remove the swinging arm bolt and captive adjuster plate from the left side.

6 Pull the swinging arm rearwards clear of the frame and collect the spacing washers.

SECTION K3

Rebushing the swinging arm

A press is necessary for this operation. Make up a shouldered pilot to the dimensions shown in *Fig. 61*. Support the swinging arm in a press in such a way that the steel center sleeve can pass completely out of the pivot bushes. Now place the shouldered pilot in the sleeve and press it out.

The nylon/steel bushes present some difficulty in removal and the only feasible method is to use a hacksaw blade to cut through the nylon and the steel outer so that the bushes can be collapsed and removed. Very great care must be taken for otherwise the hacksaw blade may break through and damage the swinging arm. To fit new bushes, a section of tube is necessary which will fit over the steel lip of the bush so that a press can be used. Press in one bush, then the other and finally refit the steel center sleeve.

SECTION K4

Swinging arm refitting

Refitting will be facilitated by removing the rear brake pedal with rod attached to give adequate clearance for the pivot stud and captive adjuster plate to be refitted from the left side. The pedal is retained to the frame by a clevis pin.

1 Position the swinging arm, with bushes and steel pivot tube fitted, between the side plates. DO NOT use any lubricant – this is present already in pockets of the nylon pivot bushes.

2 Position the spacing washers between the ends of the swinging arm spacer tube and the frame side plates (see *Fig. 62*). This is most easily achieved by threading the pivot stud with captive adjuster plate through the left side plate, spacer washer and swinging arm. Place the right spacer washer in position and continue to slide the pivot stud through into the right side plate, until fully home.

3 Fit the right side adjuster plate so that the flats locate with those on the spindle.

4 Fit the pivot stud washer with recess inboard and the large spindle nut.

5 Fit the plain washers and nuts to both adjuster plate studs – do not tighten fully yet since adjustment will be required at a later stage.

6 The swinging arm shoud now pivot easily without binding.

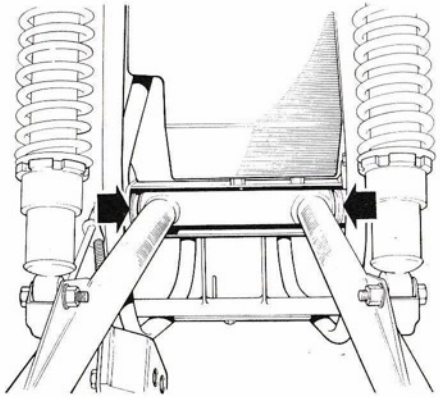


Fig. 62 Showing swinging arm spacers in position.

7 Refit the brake pedal with rod and secure from behind with the clevis pin which must be spread.

8 Lift the swinging arm and engage the bottom end of both suspension units; refit the bolts, heads outboards and secure the nuts.

9 Refit the rear wheel (Section H2).

10 Reconnect the rear chain over the sprocket and fit the split link, closed end forwards on the top run of the chain.

11 Adjust rear chain tension (see Section H5).

12 Adjust the rear brake (see Section H5).

SECTION K5

Rear chain adjustment

This is made at the rear fork pivot so that the rear wheel stays in alignment at all times. To adjust, slacken the adjuster nuts and the pivot stud right hand nut. Use a spanner on the left hand (welded-on) pivot spindle nut (see *Fig. 63*), the entire fork can be moved fore or aft as required to achieve the correct tension. The chain tightens progressively as the rear suspension compresses thus the correct tension of 1 in. (25·4 mm) is achieved with the rear suspension FULLY depressed. It is important that motorcycles with the later swinging arm have chain tension adjusted with the rider seated. When the chain adjustment is correct, lock up the adjuster nuts and pivot stud nut and make sure that rear brake adjustment is correct.

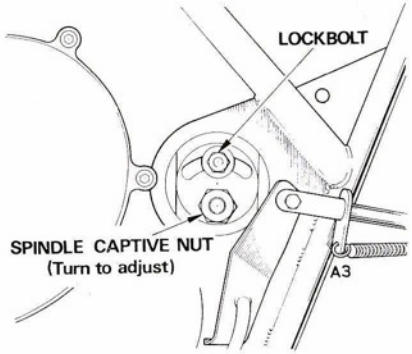


Fig. 63 Swinging arm adjustment.

SECTION K6

Footpegs

The footpegs are spring loaded to fold if they come into contact with the ground and the footpeg hangers are splined to the frame so that they can be positioned to suit the rider's requirements. If a footpeg is to be removed, the clamping bolt must be removed completely since it locates to a groove in the splines.

Note that both footpegs are made up of identical components – only the order of assembly differs.

SECTION K7

Skid plate

The skid plate is secured to the frame engine cradle tube cross members by clips. It is recommended that the clip bolt heads are positioned outside (that is, below) the plate.

SECTION K8

Airbox

The airbox is concealed behind the left side number plate. Although an air filter element is fitted, riders are advised to select the element more suited to local operating conditions.

The following elements are recommended:

Dry dusty conditions – oiled plastic foam – FILTRON TYPE K400 (AJS No. 0700354)

Wet muddy conditions – dry paper – COOPERS TYPE 7660T (AJS No. 0700199)

To change the element

1 Remove the left side number plate – this is secured by the single center nut and large diameter washer only.

2 Remove the filter center self locking nut and lift the dished outer plate away.

3 Lift out the element and plastic backing ring (if fitted).

The paper type of element cannot be cleaned satisfactorily though as a temporary expedient it may be cleaned partially by compressed air or by use of a soft brush. Gasoline (petrol) and other solvents should never be used. When the element is heavily blocked, it must be replaced.

The Filtron element can be cleaned by washing, first in gasoline (petrol) then in hot soapy water and allowing to dry thoroughly. Whether a new or cleaned filter element is to be fitted, this must be soaked in SAE 40 oil for three to four hours and be allowed to drain before fitting.

After cleaning the inside of the airbox, commence reassembly as follows:

4 Apply heavy grease to the airbox lip and place in position the plastic backing disc.

5 Place the element in position and ensure that it fits over the airbox lip.

6 Position the dished end plate (concave side outboard) so that it locates well on the end of the element and secure with the self locking nut which must be screwed on to leave $\frac{1}{2}$ in. (12·7 mm) clear thread.

7 Smear the inside of the airbox and cover with grease to attract dust before it reaches the element.

8 Ensure the plastic beading is fitted over the edge of the airbox and fit the number plate, securing with large washer and nut and checking that the number plate fits close all round.

Removing the complete airbox

If preferred, the airbox can be removed without disturbing the element.

1 Remove the two front and one rear bolt. Note that the bolts fit from inside the airbox and must not be reversed.

2 Collect the single rubber washer between the rear of the airbox and the frame, also the double rubber washers between the front of the airbox and the frame.

3 Pull the airbox away from the frame, leaving the air hose secured to the carburetor by the clip.

Whilst the airbox is clear of the frame, take the opportunity to re-seal the spot welded seams in the area of the air filter element using a suitable gasoline (petrol) proof compound from outside the airbox.

Reassembly is a reversal of the foregoing but take care to tighten the air hose clip securely.

SECTION K9

Right side number plate

Removal of this plate gives access to the H.T. coil and connections. To remove, take off the two self locking nuts and washers and ease the number plate off collecting the spacers fitted over the securing bolts between the frame and number plate.

SECTION K10

Removing and refitting the seat

Remove the nut and washer from both suspension unit top bolts. Now pull the bolts out slightly to free the seat brackets (in the case of 370/410 the rear exhaust mounting nut must be removed to allow the expansion chamber to clear the suspension unit bolt). The seat is secured by a rubberised webbing strap at the front – the strap passing beneath the frame tube. Remove only the bolt at the right side to release the strap. The seat will now lift clear.

Reassembly is a reversal but note that the front strap should be secured to the seat by tightening the left bolt completely before offering the seat to the frame.

SECTION K11

Removing and refitting the fuel tank

Turn off the fuel and disconnect the fuel line at the tap. Remove the two tank securing nuts and large washers. Take care not to scratch the tank on the front number plate securing clips and lift the tank clear, complete with flexible mountings. Do not be concerned if the mountings unscrew from the tank and remain with the frame. Steel threaded pommels on the tank base will still permit simple reassembly. Before refitting, or fitting a new tank, check that the foam rubber pads are fixed with adhesive beneath the front and rear of the tank tunnel. Place the tank in position and secure the self locking nuts at the mountings. Take care not to over-tighten and split the fuel line union when reconnecting to the tap.

SECTION K12

Removing and refitting the exhaust system

Remove the self locking nut and large washer holding the expansion chamber to the flexible mounting beneath the tank. Remove the self locking nut and large washer at the rear mounting (just forward of the right rear suspension unit). The exhaust merely pushes into the exhaust flange. Pull the exhaust system clear of the flexible mounting studs and withdraw forwards through the frame, complete with heat shield. When refitting the system, thread the system through the frame, enter the exhaust port flange and connect both flexible mountings. Secure with large washers and self locking nuts. The armoured portion of the thottle cable should lie to the left of the expansion chamber.

The heat shield is secured by two screws with plain washers between the expansion chamber and heat shield and spring washers beneath the screw heads.

Fig. 64 Order of assembly of front fender fixings.

SECTION K13

Rear fender

The rear fender is mounted at three points. The front end of the fender is secured by two bolts, nuts and washers to a triangular plate which in turn is secured by a single bolt to the frame. The rear bolts are fitted with rubber washers interposed between the frame lugs and fender and plain washers with self locking nuts are used. IT IS IMPORTANT to fit the bolt heads from beneath the fender.

SECTION K14

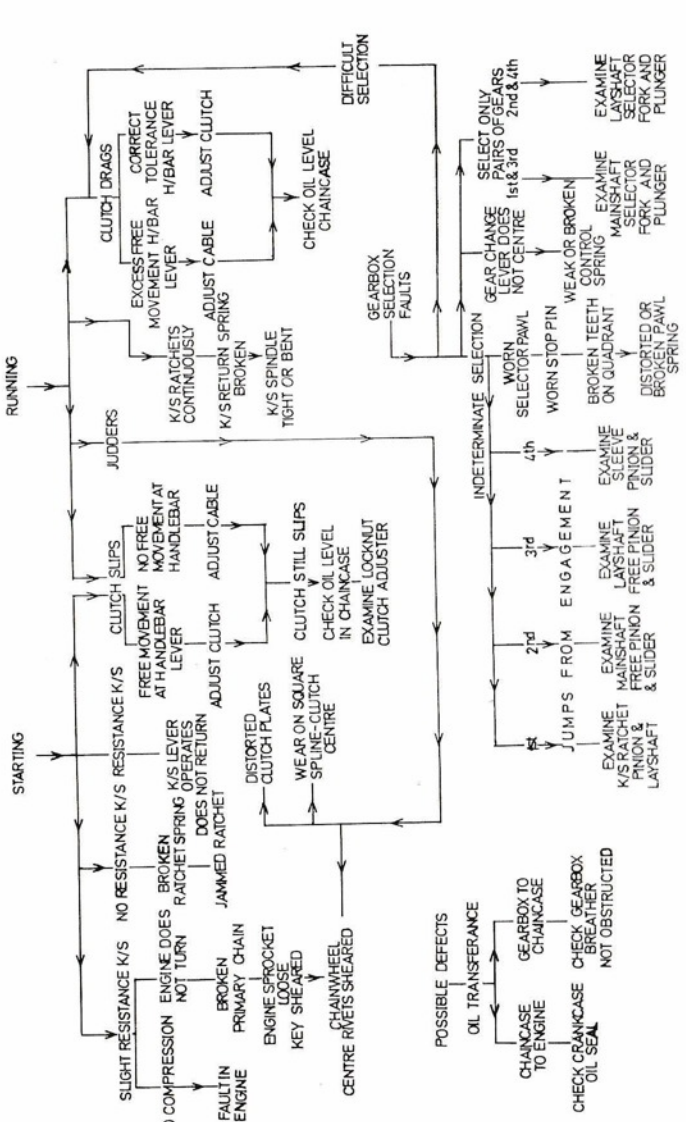
Front fender

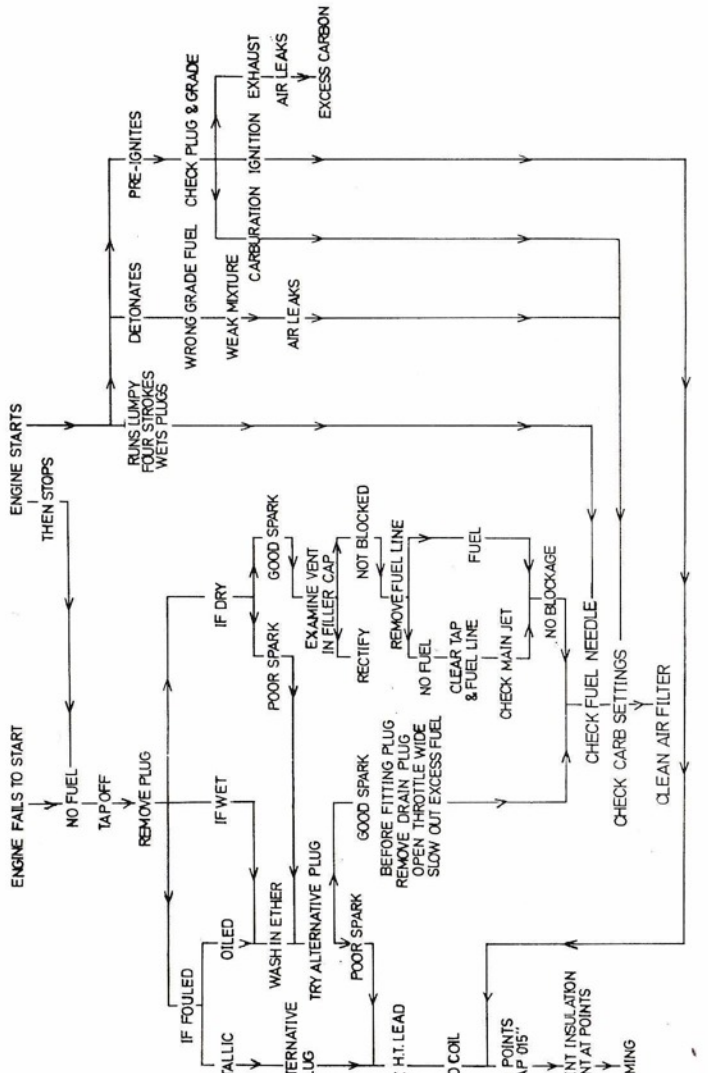
The fender is mounted on a diagonal spring bracket, the bracket being mounted direct to the lower fork yoke by two bolts and spring washers. The order of assembly of the hardware securing the fender to the bracket, from beneath the fender, is as shown in *Fig. 64.* When replacing the front fender note that the bracket fits, with the cranked end downwards behind the fork yoke and that the front end of the fender is the longer end.

SECTION K15

Front number plate

The number plate is secured to the fork main tubes by spring clips. "O" rings are stretched over the ends of the clips for extra security and should be examined periodically and replaced if showing signs of perishing.


STARTING
RUNNING
SLIGHT RESISTANCE K/S
NO RESISTANCE K/S
RESISTANCE K/S
CLUTCH SLIPS
JUDDERS
NO COMPRESSION
ENGINE DOES NOT TURN
BROKEN RATCHET SPRING
K/S LEVER OPERATES DOES NOT RETURN
JAMMED RATCHET
FREE MOVEMENT AT HANDLEBAR LEVER
NO FREE MOVEMENT AT HANDLEBAR
ADJUST CLUTCH
ADJUST CABLE
FAULT IN ENGINE
BROKEN PRIMARY CHAIN
ENGINE SPROCKET LOOSE
KEY SHEARED
CHAINWHEEL RIVETS SHEARED
DISTORTED CLUTCH PLATES
WEAR ON SQUARE SPLINE-CLUTCH CENTRE
CLUTCH STILL SLIPS
CHECK OIL LEVEL IN CHAINCASE
EXAMINE LOCKNUT CLUTCH ADJUSTER
K/S RATCHETS CONTINUOUSLY
K/S RETURN SPRING BROKEN
K/S SPINDLE TIGHT OR BENT
EXCESS FREE MOVEMENT H/BAR LEVER
ADJUST CABLE
CLUTCH DRAGS
CORRECT TOLERANCE H/BAR LEVER
ADJUST CLUTCH
CHECK OIL LEVEL CHAINCASE
DIFFICULT SELECTION
GEARBOX SELECTION FAULTS
INDETERMINATE SELECTION
WORN SELECTOR PAWL
WORN STOP PIN
BROKEN TEETH ON QUADRANT
DISTORTED OR BROKEN PAWL SPRING
GEAR CHANGE LEVER DOES NOT CENTRE
WEAK OR BROKEN CONTROL SPRING
SELECT ONLY PAIRS OF GEARS 1st & 3rd
SELECT ONLY PAIRS OF GEARS 2nd & 4th
EXAMINE MAINSHAFT SELECTOR FORK AND PLUNGER
EXAMINE LAYSHAFT SELECTOR FORK AND PLUNGER
JUMPS FROM ENGAGEMENT
1st
2nd
3rd
4th
EXAMINE K/S RATCHET PINION & LAYSHAFT
EXAMINE MAINSHAFT FREE PINION & SLIDER
EXAMINE LAYSHAFT FREE PINION & SLIDER
EXAMINE SLEEVE PINION & SLIDER
POSSIBLE DEFECTS
OIL TRANSFERANCE
CHAINCASE TO ENGINE
GEARBOX TO CHAINCASE
CHECK CRANKCASE OIL SEAL
CHECK GEARBOX BREATHER NOT OBSTRUCTED


ENGINE STARTS
THEN STOPS
RUNS LUMPY FOUR STROKES WETS PLUGS
DETONATES
PRE-IGNITES
WRONG GRADE FUEL
CHECK PLUG & GRADE
WEAK MIXTURE
CARBURATION
IGNITION
EXHAUST
AIR LEAKS
EXCESS CARBON
ENGINE FAILS TO START
NO FUEL
TAP OFF
REMOVE PLUG
IF WET
IF DRY
POOR SPARK
GOOD SPARK
EXAMINE VENT IN FILLER CAP
NOT BLOCKED
RECTIFY
REMOVE FUEL LINE
NO FUEL
CLEAR TAP & FUEL LINE
FUEL
CHECK MAIN JET
NO BLOCKAGE
CHECK FUEL NEEDLE
CHECK CARB SETTINGS
CLEAN AIR FILTER
IF FOULED
METALLIC
OILED
WASH IN ETHER
FIT ALTERNATIVE PLUG
TRY ALTERNATIVE PLUG
POOR SPARK
GOOD SPARK
BEFORE FITTING PLUG REMOVE DRAIN PLUG OPEN THROTTLE WIDE SLOW OUT EXCESS FUEL
CHECK H.T. LEAD
L.T. TO COIL
CLEAN POINTS RE-GAP .015"
CHECK POINT INSULATION L.T. CURRENT AT POINTS
TIMING