Workshop manual

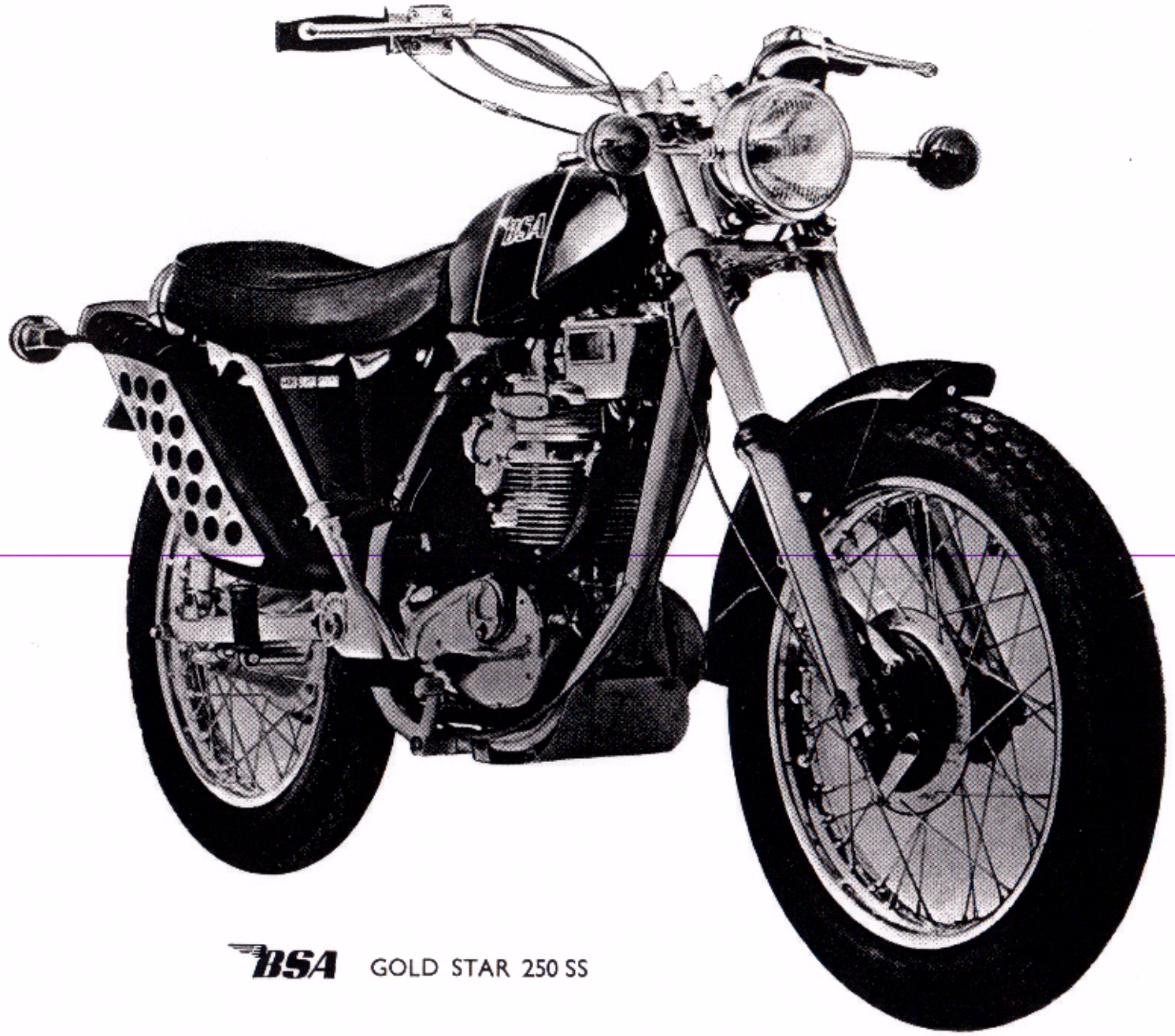
250 cm³ & 500 cm³ models

B25SS	**Gold Star**
B25T	**Victor**
B50SS	**Gold Star**
B50T	**Victor**
B50MX	**Victor**

International Triumph B.S.A. (Parts & Service) Ltd
Service Dept.:
Armoury Road, Birmingham B11 2PX.
Telephone: 021 772 2381. *Telex:* 33315
Telegrams and Cables:
"Selmoto" Birmingham

Printed in England

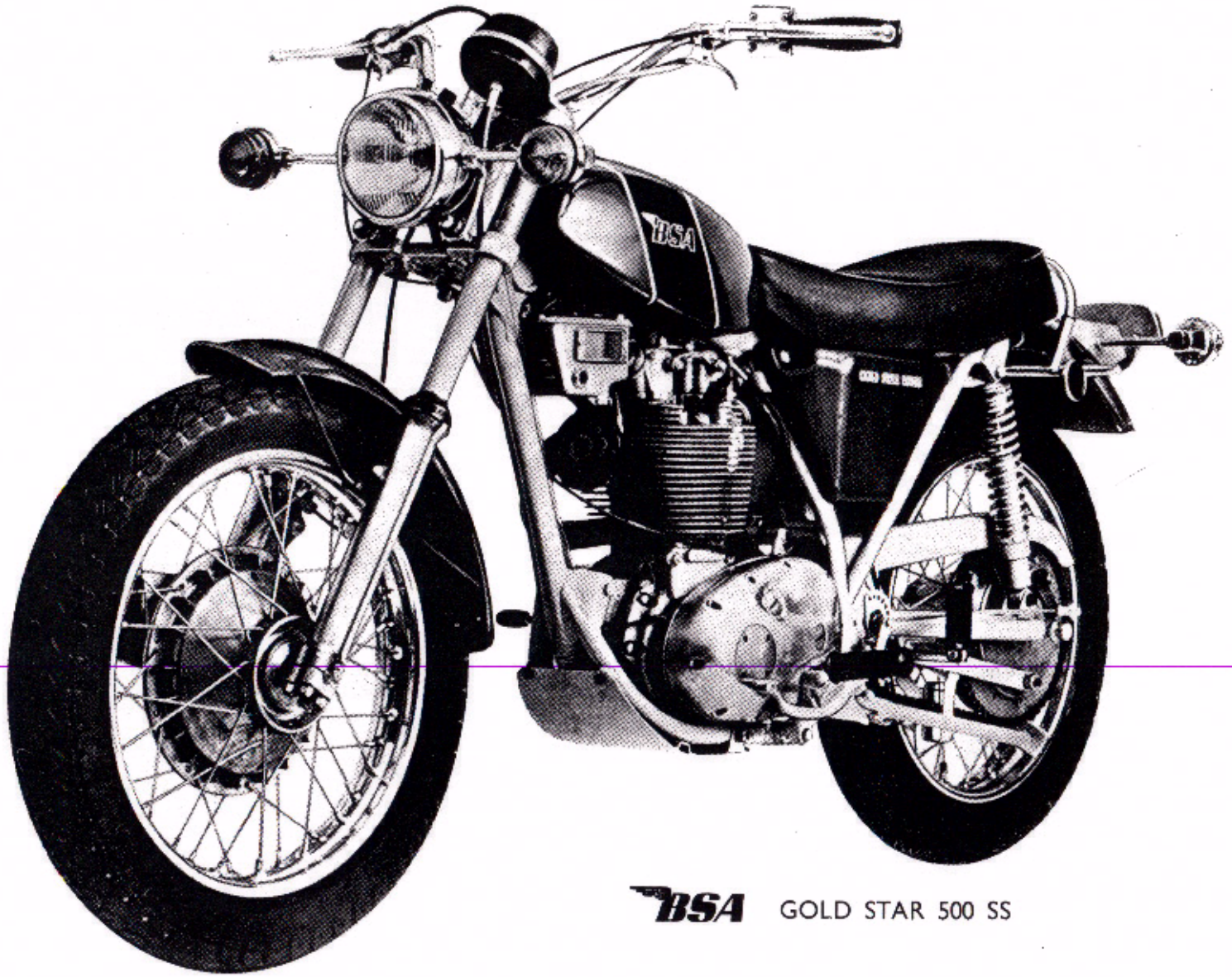
June, 1973



BSA GOLD STAR 250 SS

BSA GOLD STAR 250 SS (U.S.A.)

BSA VICTOR 250



BSA GOLD STAR 500 SS

BSA VICTOR 500

BSA VICTOR MX 500

Introduction

This manual has been compiled to provide comprehensive service information for the B.S.A. owner and for the workshop fitter wishing to carry out either basic maintenance or major repair work. It is written in great detail, but because of the specialised skills and equipment required to carry out some of the work described, the inexperienced owner is strongly advised to consult his dealer whenever he is in doubt as to his own ability to carry out a satisfactory job.

The manual is divided into sections dealing with the major assemblies and these are sub-divided into the individual operations required for maintenance and repair. It is hoped that by using this arrangement, the manual will be found most useful as a quick work of reference even to the skilled mechanic.

All information and data given in this manual is correct at the time of publication but because of our policy of constant development, changes in specification are inevitable. Anyone finding this manual to be at variance with the machine in his possession is advised to contact the Service Department, where up-to-date information will be quickly provided.

ENGINE AND FRAME NUMBERS

Both engine and frame numbers, together with prefix and suffix letters, must be quoted in full on any correspondence relating to the machine or on any enquiry regarding this manual, to either the dealer or the Service Department.

The engine number ("A") is stamped on the left-hand side of the crankcase immediately below the cylinder base. The frame number ("B") is stamped on the prop-stand lug, or, on later models, on the left side of the steering head.

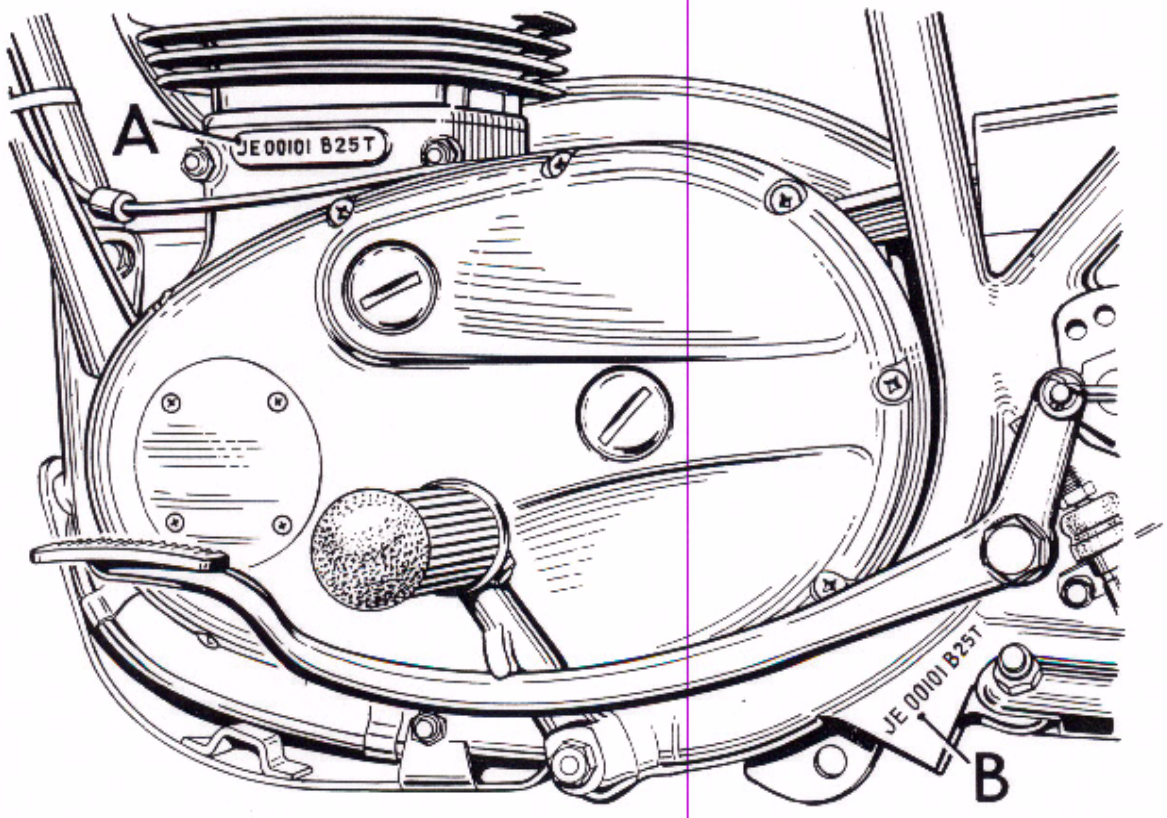


FIG. 1. *Engine and frame numbers.*

Factory Service Arrangements

(UNITED KINGDOM)

REPLACEMENT PARTS

Replacement parts are distributed through a national network of B.S.A. dealers, each of whom holds a stock of fast moving parts. These dealers have been selected for appointment as specialist replacement part stockists and each holds a comprehensive stock of replacement parts.

A complete list of appointed stockists is printed at the end of this manual, and also in every parts list.

GUARANTEE CLAIMS

In the interests of all concerned it is best that any owner of a new motor-cycle wishing to claim assistance under guarantee should do so through the dealer from whom his machine was purchased. All B.S.A. dealers are familiar with the procedure designed to give quick service to any owner of a B.S.A. motor-cycle who may find himself in difficulty.

REPAIRS

Most appointed B.S.A. dealers are able to carry out major repair work, and owners are asked to make all repair arrangements through their chosen dealer.

In the great majority of cases local repair will be possible and this will avoid the expense, inconvenience, and possibility of the machine being damaged in transit to or from the works.

Should your dealer decide that Service Department attention is required he will know how to make suitable arrangements with the factory. It is important to remember that a machine cannot be accepted at the works without prior appointment. Appointments may be made either by letter or telephone.

TECHNICAL ADVICE

B.S.A. Service Department staff are experienced in dealing with technical problems of all kinds and will be pleased to help in the event of difficulty. The correct address of the Service Department is as follows:—

International Triumph BSA (Parts and Service) Ltd
SERVICE DEPARTMENT,
ARMOURY ROAD,
BIRMINGHAM, B11 2PX.
Telephone: 021-772 2381.

WORLD SERVICE ARRANGEMENTS

In most markets of the world, B.S.A. have an appointed distributor to whom all service enquiries should be addressed.

These distributors are listed at the back of this manual, and also in all parts lists.

PROPRIETARY PARTS

Equipment not of our manufacture which is fitted to our motor-cycles is of the highest quality, but guaranteed separately by the manufacturer concerned. Any complaint or repair should be addressed to the manufacturer or his accredited agent who will give every possible assistance.

CARBURETTERS	Amal Limited, Holdford Road, Witton, BIRMINGHAM 6.
CHAINS	Renolds Chains Limited, Renold House, Wythenshawe, MANCHESTER.
ELECTRICAL EQUIPMENT	Joseph Lucas Limited, Gt. Hampton Street, BIRMINGHAM 18.
REAR DAMPERS	Girling Limited, Birmingham Road, WEST BROMWICH, Staffordshire.
SPARKING PLUGS	Champion Sparking Plug Co. Ltd., FELTHAM, Middlesex.
SPEEDOMETERS	Smith's Motor Accessories Limited, Cricklewood Works, LONDON N.W.2.
TYRES	Dunlop Company Limited, Fort Dunlop, BIRMINGHAM 24.

U.S.A. SERVICE ARRANGEMENTS

REPLACEMENT PARTS

Replacement parts are available through a network of B.S.A. dealers covering the entire United States. These dealers are listed under "Motorcycles" in the yellow pages of your telephone directory. All requests for parts must be made through franchised B.S.A. dealers; they are not sold direct to owners by the two factory branches.

GUARANTEE CLAIMS

In the interests of all concerned the owner of a new motor-cycle wishing to claim assistance under guarantee must do so through the dealer from whom his machine was purchased.

REPAIRS

B.S.A. dealers are capable of servicing and repairing B.S.A. motor-cycles; ask your dealer to help when repairs are needed.

Labour time will be greatly reduced if proprietary articles, such as legshields, crash bars, carriers or fibre-glass fairings are removed before handing the machine over for repair. Accessories such as mirrors or badges should always be removed before entrusting a machine to an independent carrier.

TECHNICAL ADVICE

The B.S.A. Service Department staff at the two U.S.A. factory branches are experienced in dealing with technical questions of all kinds and will be pleased to help in the event of difficulty.

The factory branch addresses are shown below:—

EASTERN: The Birmingham Small Arms Company Incorporated.
B.S.A. Sales Division,
P.O. Box 6790,
Towson,
Baltimore,
Maryland 21204.

WESTERN: The Birmingham Small Arms Company Incorporated,
B.S.A. Sales Division,
P.O. Box 337,
Duarte,
California 91010.

In all communications the engine and frame numbers with prefix and suffix letters and figures must be quoted as well as the year and model of the motor-cycle in question.

B.S.A. DEALER PRE-DELIVERY SERVICE

The following tasks must be completed before making delivery of a new B.S.A. motor cycle:—

(1) CHECK CLEANLINESS AND CORRECT SPARK PLUG GAP.

(2) CHECK AND ADJUST TYRE PRESSURES.

(3) CHECK ALL EXTERNAL NUTS AND BOLTS FOR SECURITY.

(4) FILL AND CHARGE BATTERY IN ACCORDANCE WITH FOLLOWING INSTRUCTIONS.

(5) CHECK ALL LIGHTS AND HORN.

(6) CHECK AND CORRECT IF NECESSARY ALL OIL LEVELS.

(7) CHECK, ADJUST AND LUBRICATE CONTROLS AND CABLES.

(8) APPLY GREASE AT ALL GREASE POINTS.

(9) TEST MACHINE ON ROAD TO ENSURE FULL ROAD WORTHINESS.

(10) REPORT ANY PROBLEMS TO B.S.A. SERVICE DEPARTMENT *BEFORE DELIVERY*.

(11) SIGN AND RETURN PRE-DELIVERY CHECK CARD.

Failure to carry out these checks or to sign and return the pre-delivery check card will nullify arrangements for the payment of guarantee labour costs.

BATTERY

The battery is supplied in a dry-charged condition and must not be filled unless it is known that the machine is to be sold within a few days.

To fill and charge the battery

All plates in the battery have been charged fully and dried completely by special process. The tape across the vent holes prevents the ingress of moisture or air and insures perfect condition of the plates during transportation and storage. This tape must only be removed immediately before the battery is brought into service.

Dilute sulphuric solution S. G. 1.260 is prepared by slowly pouring one part of concentrated sulphuric acid into three parts of distilled water (by volume) or of S.G. 1.210 by adding one part of concentrated sulphuric acid to four parts of distilled water (by volume). **It is most important to add acid to water,** not water to acid due to the violence of the chemical reaction involved.

A glass, earthenware or lead vessel should be used and the mixture well stirred. Allow to cool to the temperature of the surrounding atmosphere before use.

Important:—With dry-charged batteries the filling of each cell with acid must be completed in one operation and levels restored after standing by syphoning off excess acid.

Fill each cell with dilute sulphuric acid to the "maximum" line at one operation. The temperature of the acid and battery must be between 60°F. (15·5°C.) and 80°F. (27°C.) (see chart).

	TEMPERATE Climates ordinarily below 90°F. (32°C.) shade temperature	TROPICAL Climates frequently above 90°F' (32°C.) shade temperature
Specific gravity for filling new cells	1·260 (at 60°F., 15·5°C.)	1·210 (at 60°F., 15·5°C.)
Specific gravity at completion of charge to be adjusted if necessary, to be between ..	1·220 and 1·300 (at 60°F., 15·5°C.)	1·210 and 1·230 (at 60°F., 15·5°C.)

(1) Batteries which have been stored at a lower temperature than 60°F. (15·5°C.) should have their temperature raised before filling by allowing the battery to stand in a warm room until it attains room temperature.

(2) Batteries used under these conditions are up to 90 per cent charged, but if time permits a freshening charge of four hours at 1·0 ampere is beneficial. If the acid level rises after the freshening charge restore the correct level by syphoning off excess acid.

Important:—On no account should the battery be topped-up to the separator guard, but only to the "maximum" line.

CONTENTS

Because the engine and transmission of the B25 and the B50 models are of different specification, it is necessary to divide data into two sections, one for each model. All other data is applicable to both models

INDEX

B25 ENGINE

CARBURETTER

Type	Amal Concentric 928/20
Main jet	200
Needle jet	·106
Needle position	1
Throttle valve	3½
Choke diameter	28 mm.
Throttle slide return spring free length	2·5" (6·4 cm.)

VALVES

Seat angle	45°
Head diameter (inlet)	1·450" — 1·455"
Head diameter (exhaust)	1·312" — 1·317"
Stem diameter (inlet)	·3095" — ·3100"
Stem diameter (exhaust)	·3090" — ·3095"

VALVE GUIDES

Material	Hidurel 5
Bore diameter	·3120" — ·3130"
Outside diameter	·5005" — ·5010"
Length	1·844"
Interference fit in head	·0015" — ·0025"
Counterbore in exhaust guide	·323" — ·326" × ·12" deep

VALVE SPRINGS

Free length (inner)	1·40"	(35·5 mm.)
Free length (outer)	1·75"	(44·5 mm.)
Fitted length (inner)	1·26"	(32·0 mm.)
Fitted length (outer)	1·37"	(34·8 mm.)

VALVE TIMING

Tappets set to ·015" (·381 mm.)
for checking purposes only:—

Inlet opens B.T.D.C.	51°
Inlet closes A.B.D.C.	68°
Exhaust opens B.B.D.C.	78°
Exhaust closes A.T.D.C.	37°

CAMSHAFT

Journal diameter, left and right	·7480" — ·7485"
Cam lift (inlet)	·345"
Cam lift (exhaust)	·336"
Base circle radius	·906"
Bush bore diameter, fitted	·7492" — ·7497"
Bush outside diameter, left and right hand	·908" — ·909"

TAPPETS

Stem diameter	·3735″— ·3740″
Clearance in crankcase	·001″

SPARK PLUG

Type	Champion N3
Gap setting	·020″ — ·025″ (·50—·65 mm.)
Thread	14 mm.

IGNITION TIMING

Piston position fully advanced B.T.D.C.	·342″ (8·68 mm.)
Crankshaft position fully advanced B.T.D.C.	37°
Contact breaker gap setting	·015″ (·38 mm.)

CYLINDER HEAD

Inlet port size	1·125″
Exhaust port size	1·25″
Material	Aluminium alloy LM4 with integral cast iron valve seats

CYLINDER BARREL

Bore diameter (standard)	67 mm.
Oversizes	·020″ and ·040″ (·5 and 1·0 mm.)
Material	Aluminium alloy LM4 with austenitic iron liner

PISTON

Compression ratio	10· : 1 (alternative 8·5 : 1, Fleetstar only)
Clearance (top of skirt)	·0042″— ·0053″
Clearance (bottom of skirt)	·0025″— ·0028″
Gudgeon pin hole diameter	·6884″— ·6886″
Material	Aluminium alloy H.G.413

PISTON RINGS

Width (top and centre)	·101″ — ·107″
Width (scrapers)	·101″ — ·107″
Depth (top and centre)	·0615″— ·0625″
Depth (scraper)	·124″ — ·125″
Clearance in groove (all rings)	·001″ — ·003″
Fitted gap (all rings)	·009″ — ·013″
Material (all rings)	Cast iron H.G. 22

OIL PUMP

Type	Double gear	
Drive ratio	1 : 4	
Non-return valve spring free length	·5"	(12·7 mm.)
Non-return valve spring ball diameter	·25"	
Pressure release valve blow-off pressure	80–100 lbs. p.s.i.	(5·6–7·0 kg./sq. cm.)
Pressure release valve spring free length	1·37"	(34·8 mm.)
Pump body material	Cast iron	

CONNECTING ROD AND CRANKSHAFT ASSEMBLY

Connecting rod small end eye diameter	·6890"— ·6894"
Connecting rod big end eye diameter	1·5630"—1·5635"
Connecting rod length between centres	5·312"
Crankshaft big end journal diameter	1·4375"—1·4380"
Regrind undersizes	·010", ·020", ·030" (·25, ·50, ·76 mm.)
Crankshaft diameter (left and right)	·9841"— ·9844"
Big end journal running clearance	·0005"— ·0015"
Crankcase main bearing (roller, left)	·875" × 2·0" × ·5625" (Hoffmann R325L)
Crankcase main bearing (ball, right)	·875" × 2·0" × ·5625" (Hoffmann 325)

CLUTCH

Type	Multiplate with integral cush drive	
Number of friction plates	5	
Number of plain plates	5	
Overall thickness of friction plate	·167"	(4·2 mm.)
Free length of springs	1·66"	(42·0 mm.)
Clutch pushrod length	9·0"	(22·9 cm.)
Clutch pushrod diameter	·1875"	
Clutch rollers	25 off, ·1875" × ·1875"	

GEARBOX

Type	4 speed, constant mesh
Layshaft bearings (needle roller)	·5" × ·625" × ·8125" (Torrington B108)
Mainshaft bearing (left)	30 · 60 · 16 mm. (Hoffmann 130)
Mainshaft bearing (right)	·625" × 1·5625" × ·4735" (Hoffmann LS7)
Layshaft diameter (left and right)	·6245"— ·6250"
Mainshaft diameter (left)	·7485"— ·7490"
Mainshaft diameter (right)	·6245"— ·6250"
Sleeve pinion inside diameter	·752" — ·753"
Sleeve pinion outside diameter	1·179" —1·180"

GEAR RATIOS

	B25SS, B25T	
Gearbox:		
Top	1·00	
Third	1·24	
Second	1·64	
First	2·65	
Overall:	B25SS	B25T
Top	6·92	7·35
Third	8·60	9·14
Second	11·35	12·06
First	18·33	19·48

SPROCKET SIZES (TEETH)

	B25SS	B25T
Engine	23	23
Clutch	52	52
Gearbox	17	16
Rear Wheel	52	52

CHAINS

Primary Chain (all models)		
Pitch	·375"	(9·53 mm.)
Roller diameter	·250"	(6·35 mm.)
Distance between plates	·225"	(5·72 mm.)
Length	70 links	
Breaking load	3,900 lbs.	(1770 Kg.)
Type	Renolds 114 038 Duplex endless	
Rear chain:		
Pitch	·625"	(15·88 mm.)
Roller diameter	·400"	(10·16 mm.)
Distance between plates	·255"	(6·48 mm.)
Length	106 links (B25SS)	107 links (B25T)
Breaking load	5,000 lbs.	(2268 Kg)
Type	Renolds 110 054	

B50

B50 ENGINE

CARBURETTER (EXCEPT MOTOCROSS)

Type	Amal Concentric 930/62	
Main jet	200	
Needle jet	·106	
Needle position	1	
Throttle valve	3½	
Choke diameter	30 mm.	
Throttle slide return spring free length	2·5"	(6·4 cm.)

CARBURETTER (MOTOCROSS ONLY)

Type	Amal Concentric R932/18	
Main jet	250	
Needle jet	·106	
Needle position	2	
Throttle valve	3	
Choke diameter	32 mm.	
Throttle slide return spring free length	2·5″	(6·4 mm.)

VALVES

Seat angle	45°	
Head diameter (inlet)	1·750″—1·755″	
Head diameter (exhaust)	1·526″—1·531″	
Stem diameter (inlet)	·3100″— ·3105″	
Stem diameter (exhaust)	·3095″— ·3100″	

VALVE GUIDES

Material	Phosphor-bronze	
Bore diameter	·3120″— ·3130″	
Outside diameter	·5005″— ·5010″	
Length	1·859″	
Interference fit in head	·0015″— ·0025″	
Counterbore in exhaust guide	·323″ — ·326″ × ·12″ deep	

VALVE SPRINGS

Free length (inner)	1·50″	(38·1 mm.)
Free length (outer)	1·67″	(42·4 mm.)
Fitted length (inner)	1·22″	(31·0 mm.)
Fitted length (outer)	1·31″	(33·3 mm.)

VALVE TIMING

Tappets set to ·015″ (·38 mm.) for checking purposes only:—

	B50SS, B50T	B50MX
Inlet opens B.T.D.C.	51°	63°
Inlet closes A.B.D.C.	68°	72°
Exhaust opens B.B.D.C.	78°	80°
Exhaust closes A.T.D.C.	37°	55°

CAMSHAFT

Journal diameter, left to right	·7480″—·7485″	
Cam lift (inlet)	·345″ (·355″ B50MX)	
Cam lift (exhaust)	·336″ (·355″ B50MX)	
Base circle radius	·906″	
Bush bore diameter, fitted	·7492″—·7497″	
Bush outside diameter, left and right	·908″ —·909″	
Tappet clearance (inlet)	·008″	(·20 mm.)
Tappet clearance (exhaust)	·010″	(·25 mm.)

SPARK PLUG

Type	Champion N4	(N3, B50MX only)
Gap setting	·020″ —·025″	(·50—·65 mm.)
Thread	14 mm.	

IGNITION TIMING

Piston position fully advanced B.T.D.C.	·385″	(9·78 mm.)
Crankshaft position fully advanced B.T.D.C.	34°	
Contact breaker gap setting	.012″ – .017″	(0.30 – 0.43mm)

CYLINDER HEAD

Inlet port size	1.20″
Exhaust port size	1.625″
Material	Aluminium alloy LM4 with cast iron valve seats

CYLINDER BARREL

Bore diameter (standard)	84 mm.	
Oversizes	·020″ and ·040″	(·5 mm. and 1·0 mm.)
Material	Aluminium alloy LM4M with austenitic iron liner	

PISTON

Compression ratio	10 : 1
Clearance (top of skirt)	·005″ —·007″
Clearance (bottom of skirt)	·0035″—·0045″
Gudgeon pin hole diameter	·7499″—·7501″
Material	Aluminium alloy H.G. 413

PISTON RINGS

Width (top and centre)	·127″ —·134″	
Width (scrapers)	·138″ —·145″	
Depth (top and centre)	·0615″—·0625″	
Depth (total, scrapers)	·1550″—·1560″	
Clearance in groove (all rings)	·001″ —·003″	
Fitted gap (all rings)	·016″ —·024″	(·40—·60 mm.)
Material (all rings)	Cast iron H.G. 22	

OIL PUMP

Type	Double gear	
Drive ratio	1 : 4	
Non-return valve spring free length	·5″	(12·7 mm.)
Non-return valve spring ball diameter	·25″	
Pressure release valve blow-off pressure	80-100 lbs. p.s.i.	(5·6-7·0 kg./sq. cm.)
Pump body material	Cast iron	

CONNECTING ROD AND FLYWHEEL ASSEMBLY

Connecting rod small end eye diameter	·8115"—·8125"
Small end bush bore diameter	·7503"—·7506"
Connecting rod big end eye diameter	2·0190"—2·0195"
Big end bush bore diameter	1·8110"—1·8116"
Connecting rod length between centres	6·00" (15·24 cm.)
Crankpin bearing diameter	1·4957"—1·4961"
Big end bearing (needle roller)	38 × 46 × 20 mm. (R & M K38-46-20F)
Flywheel shaft diameter (left and right)	·9841"—·9844"
Crankcase main bearings (roller, left and right)	·875" × 2·0" × ·5625" (Hoffmann R325L)
Crankcase main bearing (ball, left)	·875" × 2·0" × ·5625" (Hoffmann LS9)

CLUTCH

Type	Multiplate with integral cush drive
Number of friction plates	5
Number of plain plates	5
Overall thickness of friction plate	·167" (4·2 mm.)
Free length of springs	1·66" (42·0 mm.)
Clutch pushrod length	9·0" (22·9 cm.)
Clutch pushrod diameter	·1875"
Clutch rollers	·1875" × ·1875", 25 off

GEARBOX

Type	4 speed, constant mesh
Layshaft bearings (needle roller)	·5" × ·625" × ·8125" (Torrington B108)
Mainshaft bearing (left)	30 × 60 × 16 mm. (Hoffmann 130)
Mainshaft bearing (right)	·625" × 1·5625" × ·4735" (Hoffmann LS7)
Layshaft diameter (left and right)	·6245"—·6250"
Mainshaft diameter (left)	·7485"—·7490"
Mainshaft diameter (right)	·6245"—·6250"
Sleeve pinion inside diameter	·752"—·753"
Sleeve pinion outside diameter	1·179"—1·180"

GEAR RATIOS

Gearbox:—	B50SS, B50T	B50MX
Top	1·00	1·00
Third	1·24	1·24
Second	1·64	1·64
First	2·65	2·18

Overall:—	B50SS	B50T	B50MX
Top	5·14	6·45	6·92
Third	6·38	8·03	8·60
Second	8·42	10·58	11·35
First	13·60	17·10	15·04

SPROCKET SIZES (TEETH)

	B50SS	B50T	B50MX
Engine	28	28	28
Clutch	52	52	52
Gearbox	17	15	14
Rear Wheel	52	52	52

CHAINS

Primary chain (all models)

Pitch	·375"	(9·53 mm.)
Roller diameter	·250"	(6·35 mm.)
Distance between plates	·225"	(5·72 mm.)
Length	72 links	
Breaking load	3,900 lbs.	(1770 Kg.)
Type	Renolds 114 038 Duplex endless	

Rear chain:—

Pitch	·625"	(15·88 mm.)
Roller diameter	·400"	(10·16 mm.)
Distance between plates	·255"	(6·48 mm.)
Length	106 links (B50MX) 107 (B50T) 108 (B50SS)	
Breaking load	5,000 lbs.	(2268 Kg.)
Type	Renolds 110 054	

FRAME AND FITTINGS
B25/B50

FRONT FORKS

Type	Coil spring, hydraulically damped	
Steering head bearings	Taper roller (Timken LM 11949L)	
Springs:	Main Spring	Recoil Spring
free length	19·5" (48·2 cm.)	·94" (23·8 mm.)
spring rate	21 lbs./in.	242 lbs./in.
number of coils	63	4½
Shaft diameter	1·3610"—1·3605"	
Sliding tube diameter	1·363" —1·364"	

SWINGING ARM

Bearings	Needle roller (Torrington B1616)
Housing diameter	1·2505"—1·2495"
Spindle diameter	·800" — ·801"

REAR SUSPENSION UNITS

	B25, B50SS, T	B25 Fleetstar	B50MX
Type	Girling coil spring, hydraulicaaly damped		
Extended length (between centres)	12·9″	12·9″	12·9″
Compressed length (between centres)	10·3″	10·3″	9·9″
Springs:			
Fitted length	8·4″	8·4″	8·4″
Spring rate	100 lbs./in.	100 lbs./in.	70/100 lbs./in.
Colour identification	Green/green/green	Green/green/green	Green/pink/green
Spring part number	64543708	64543708	64543626
Part number (complete unit)	64052483	64052453	64052487

WHEELS, BRAKES AND TYRES

WHEELS

	B25T, B50T & B50MX	B25 & B50SS, B25 Fleetstar	B25SS (U.S.A. only)
Rim size and type:			
(Front)	WM1×20	WM2×18	WM2×18
(Rear)	WM3×18	WM2×18	WM2×18

Spoke sizes:

The length of a spoke (L) is ascertained by measuring from the threaded end to the intersection of the two centre-lines (as in Fig. 2). This method applies whatever angle (A) may be.

FIG. 2. *Measurement of spoke length.*

Front (right, outer) 10	10SWG · 7·37″	10SWG · 4·67″	10SWG×6·42″
Front (right, inner) 10	10SWG · 7·25″	10SWG · 4·54″	10SWG · 6·31″
Front (left) 20	10SWG · 8·77″	10SWG · 6·92″	10SWG · 7·73″
Rear (left, inner) 10	all models	10SWG · 5·72″	
Rear (left, outer) 10	all models	10SWG · 5·91″	
Rear (right) 20	all models	10SWG · 6·92″	
Bearings, front and rear, all models	20 × 47 × 14 mm. ball journal (Hoffmann 120)		

BRAKES

	B25SS, T, B50T B50MX	B25, B50SS, B25 Fleetstar
Front:		
Diameter and type	6" single leading shoe	8" twin leading shoe
Width	·875"	1·5"
Rear:		
Diameter and type	7" single leading shoe	7" single leading shoe
Width	1·125"	1·125"
Lining area, sq. in. (sq. cm.)		
Front	9·8 (63·3)	22·5 (145·4)
Rear	17·4 (112·4)	17·4 (112·4)

TYRES

	B25 & B50SS	B25T & B50T	B50MX
Type (Dunlop)	K70	Trials Universal	Sports
Size:			
Front	3·25 × 18	3·00 × 20	3·00 × 20
Rear	3·50 × 18	4·00 × 18	4·00 × 18
Pressures (p.s.i.)			
Front on road	22	22	—
Rear on road	24	24	—
Front off road	—	10	8
Rear off road	—	14	12

ELECTRICAL EQUIPMENT

	B25 & B50 SS, T	B50MX
Battery	PUZ5A	—
Capacitor	2MC	—
Coil	17 M 12	Wipac 967
Ignition capacitor	54441582	54441582
Contact breaker	6CA	6CA
Flasher unit	8FL	
Generator:		
Stator	RM21	RM22
Rotor	54213901	54213901
Handlebar switch unit, right	169 SA (39596)	—
Handlebar switch unit, left	169 SA (39595)	—
Headlamp	MCH 66	—
Horn	6H, High note	—
Ignition switch	149 SA	—
Rear stop switch	118 SA	—
Rectifier	2DS 506	—
Tail lamp	L689	—
Zener diode	ZD715	—

Bulbs:	Rating	Type
Headlamp	50/40 watt	370 (371 France only)
Stop-tail	21/5 watt	380
Flasher	21 watt	382
Speedometer	6 watt	281 or 643
Tachometer	6 watt	281 or 643
Warning lights	24 volt. 2 watt	281
Pilot	6 watt	989

CAPACITIES

	B25 & B50SS	B25 & B50SS (U.S.A. only)	B25 & B50T	B50MX
FUEL TANK				
British gallons	3	2	2	1
U.S. gallons	3½	2½	2½	1½
Litres	13·5	9	9	4·5
OIL RESERVOIR				
British pints			4	
Litres			2·25	
GEARBOX				
British pints			½	
cm³			280	
PRIMARY CHAINCASE				
British pints			¼	
cm³			140	
FRONT FORK (EACH LEG)				
British pints			⅓	
cm³			190	

DIMENSIONS

	B25 & B50 SS	B25 & B50 T	B50 MX
Overall length ins. (cm.)	85 (216)	85 (216)	82½ (209)
Wheelbase ins. (cm.)	54 (137)	54 (137)	54 (137)
Ground Clearance ins. (cm.)	7 (17·8)	7½ (19)	7½ (19)
Overall width ins. (cm.)	29 (73·7)	29 (73·7)	33½ (85)
Seat height ins. (cm.)	32 (81)	32 (81)	32 (81)
Overall height ins. (cm.)	43·5 (110·5)	43·5 (110·5)	43·5 (110·5)

WEIGHTS

	B25SS	B25T	B50SS	B50T	B50MX
Machine unladen (lbs.)	290	287	310	298	240
(Kg.)	131·5	130·2	140·6	135·2	108·8
Engine/gearbox unit (lbs.)	83	83	86	86	86
(Kg.)	37·6	37·6	39	39	39

GEAR RATIO CALCULATION

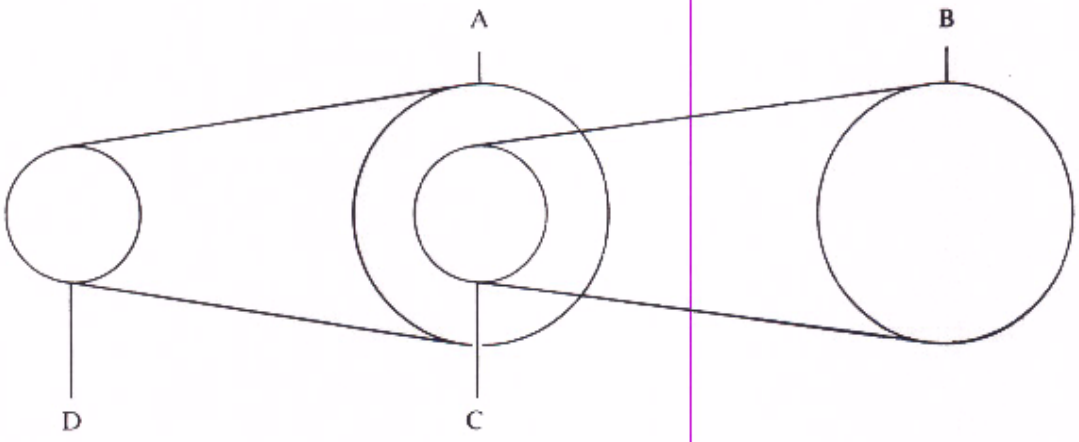


FIG. 3.

To find the gear ratios of a machine, first calculate top gear as follows:—

Divide the number of teeth on the clutch sprocket (A) by the number of teeth on the engine sprocket (D) and multiply the result by the number of teeth on the rear wheel sprocket (B) divided by the number of teeth on the gearbox sprocket (C) for example:—

$$\frac{\textit{clutch sprocket}\ (52)}{\textit{engine sprocket}\ (23)} \times \frac{\textit{rear wheel sprocket}\ (52)}{\textit{gearbox sprocket}\ (17)} = \frac{2704}{391} = 6{\cdot}89$$

To find the intermediate ratio, multiply top gear by the internal ratio concerned, for example:—

top gear 6·89 × *bottom gear internal ratio* 2·65 = 14·03 *bottom gear ratio*

$$\text{Gearbox internal ratio} = \frac{\textit{layshaft gear}}{\textit{mainshaft gear}} \times \frac{\textit{mainshaft top gear}}{\textit{layshaft top gear}}$$

for example:—

$$\frac{(\textit{layshaft}\ 3rd)\ 22T}{(\textit{mainshaft}\ 3rd)\ 26T} \times \frac{(\textit{mainshaft top})\ 23T}{(\textit{layshaft top})\ 17T} = 1{\cdot}144$$

INDEX

ROUTINE LUBRICATION

Ref. No. (Fig. A1)		
	EVERY 250 MILES (400 Km.)	
1	Check oil level.	
	EVERY 1,000 MILES (1,500 Km.)	
2	Check oil level in primary chaincase (B25 only)	Page A9
	EVERY 2,000 MILES (3,000 Km.)	
3	Check oil level in transmission case (gearbox)	Page A9
2	Drain and refill primary chaincase	Page A9
9, 1	Drain and refill the oil reservoir	Page A6
10	Clean oil filters	Page A6
15	Lubricate side stand pivot (oil).	
4	Lubricate rear chain	Page A11
5	Lubricate contact breaker cam	Page A8
5	Lubricate auto-advance mechanism	Page A8
16	Lubricate brake pedal pivot	
6	Oil exposed cables and control rod joints	Page A10
7	Grease clutch cable	
18	Grease swinging arm bearings	Page A10
8	Grease speedometer drive	Page A10
	EVERY 4,000 MILES (6,500 Km.)	
3	Drain and refill transmission case (gearbox)	Page A9
11	Clean external oil filter (B25 only)	Page A7
12	Examine pump ball valve	Page A7
17	Grease rear brake cam spindle	
	EVERY 10,000 MILES (15,000 Km.)	
13	Drain and refill front forks	Page A10
14	Clean and repack wheel bearings with grease	Page A10

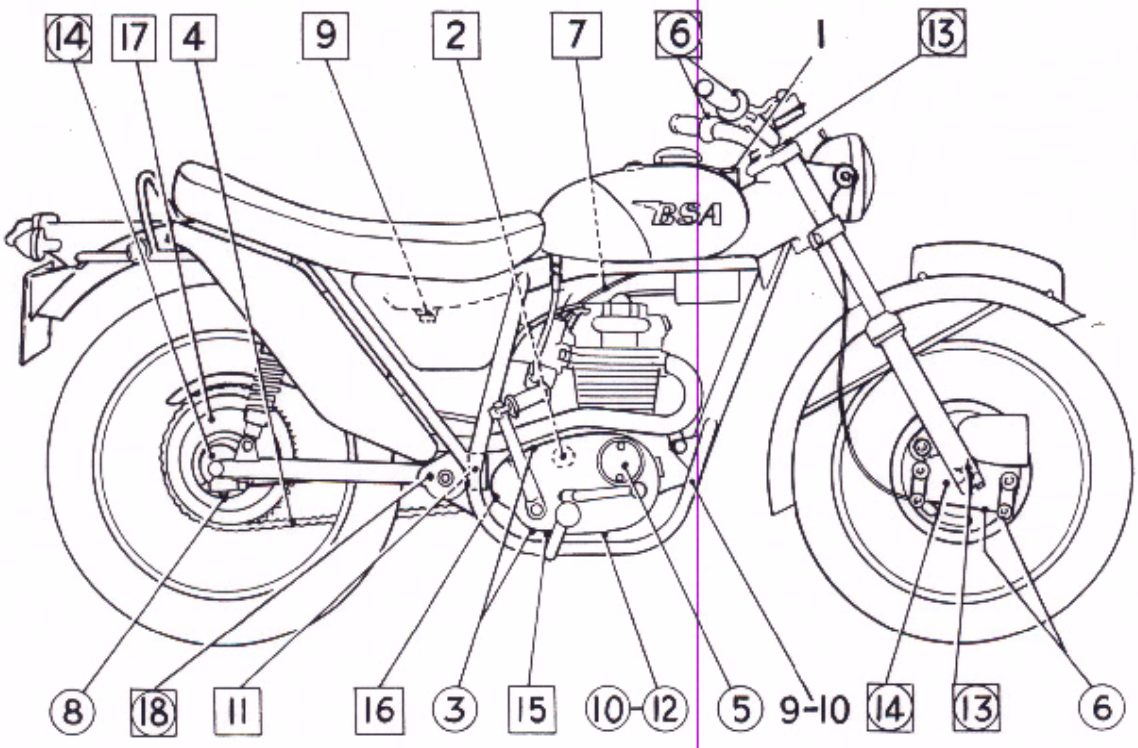


FIG. A1. *General lubrication diagram for all models.*
(The numbers in circles refer to the right side of the machine and numbers in squares refer to the left side.)

The choice of lubricant grade is, to a certain extent, dependent on the application of the machine and the climate in which it is to be used. The chart below gives recommended lubricants for use in temperate climates. In countries where climatic conditions are extreme, obviously some variation in grade will be necessary to provide adequate lubrication. Remember that the higher the temperature, the higher the S.A.E. number required.

Note:—During factory testing the engine is run on a mineral-base oil and a similar type of oil **must** be used thereafter. If it is desired to change to a vegetable-base oil, the engine and oil reservoir must be thoroughly cleansed of the previous lubricant. If the two types of oil are mixed, an emulsion will be formed which will damage the engine.

RECOMMENDED LUBRICANTS

Brand	Engine (Chaincase, B50 only)	Gearbox	Chaincase (B25 only)	Front Forks	Grease
Castrol	GTX or XL	Hypoy	Castrolite	TQF	Castrolease LM
Mobil	Super 20W50	Mobilube GX90	Super	ATF 210	Mobilgrease MP or Super
Shell	Super 20W50	Spirax 90EP	Super Motor Oil	Donax T7	Retinax A
B.P.	Super Visco-Static	Gear Oil 90EP	Super Visco-Static	Autran B	Energrease L2
Texaco	Havoline 20W50	Multigear 90EP	Havoline 10W30	Texomatic F	Marfak All-Purpose
Esso	Uniflo	Gear Oil GX90/140	Uniflo	Esso Glide	Multipurpose H

APPROVED LUBRICANTS

The following lubricants are also approved for use in B.S.A. motor-cycles: Duckham's—motor and chaincase oil, Q20–50; transmission (gearbox), Hypoid 90; forks, Q-Matic; chaincase (250 cm^3 only), Q5500; grease, LB10. Filtrate—motor and chaincase oil, Super 20W/50; transmission (gearbox), EP90; forks, AT Fluid F; chaincase (250 cm^3 only). Super 10W/30; grease, Super Lithium.

Approval is also given to lubricants marketed by companies other than those listed above, provided that they have similar multi-grade characteristics and meet the A.P.I Service M.S. performance level.

It is always advisable to make sure that the oil in the lubricating system is warm before driving at high speeds. When taking part in competitive events, advantage should be taken of any warming-up period to run the engine in order to warm and circulate the oil.

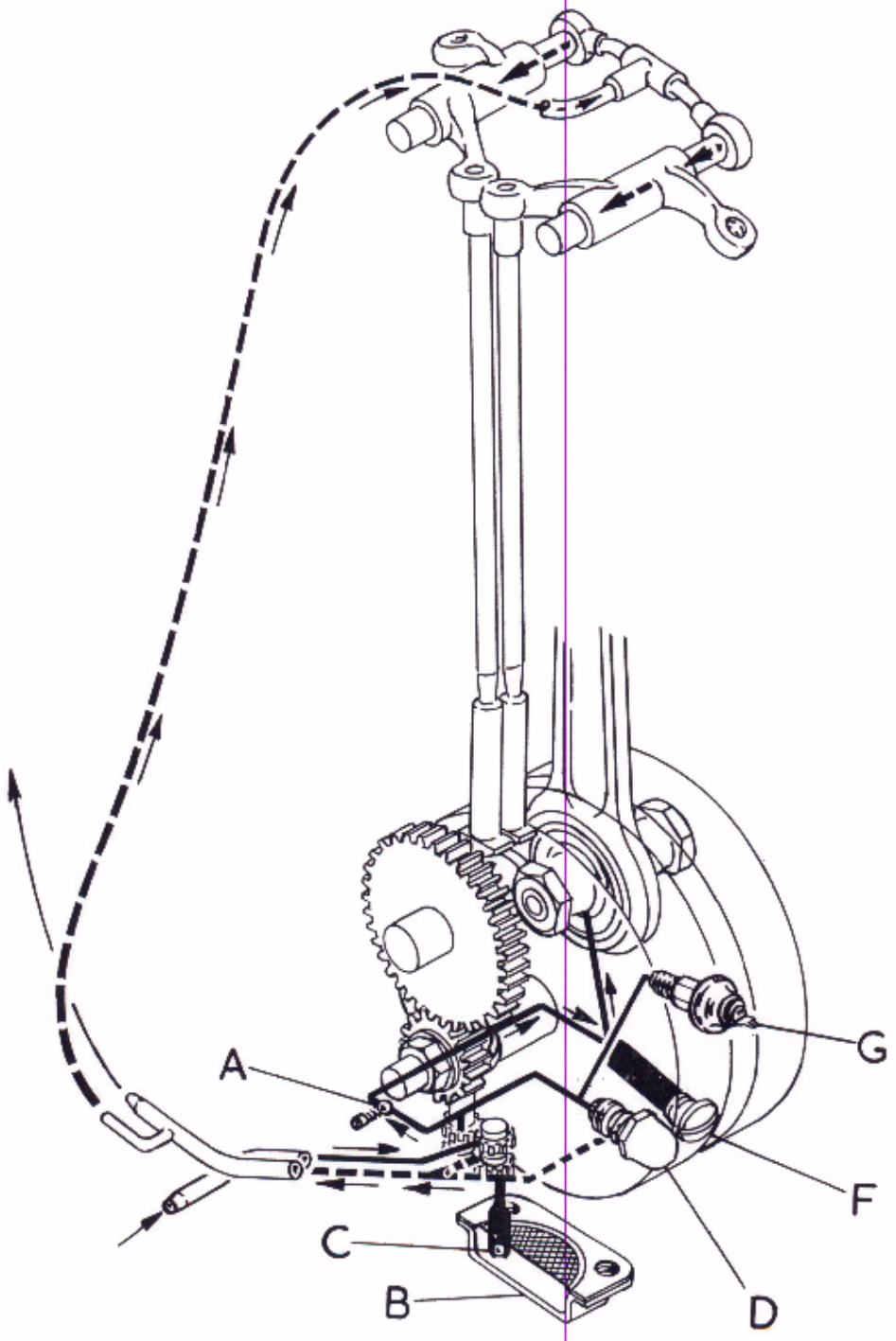


FIG. A2. *General engine lubrication diagram.*

A — Non-return valve (feed side)
B — Sump plate and filter
C — Non-return valve (return side)
D — Pressure release valve
F — Crankshaft sludge trap
G — Oil pressure switch (B25 only)

ENGINE LUBRICATION

The lubrication system is of the dry sump type, i.e., oil is contained in an external reservoir. This reservoir is incorporated in the main frame tubes (see Fig. A3).

Oil is drawn from the reservoir through a gauze filter at the base of the front tube by a double gear pump situated in the right side of the crankcase and driven by a worm drive on the engine shaft. The shallow gears in the top of the pump feed oil under pressure past a non-return valve to the big-end bearing via a drilling in the timing side engine shaft and centrifugal sludge trap. The sludge trap will arrest any foreign matter which would otherwise circulate with the oil.

Because of oil pressure at the big end, oil is forced between the bearing surfaces and is discharged by centrifugal force on to the cylinder walls and moving parts within the crankcase.

After lubricating various components the oil then drains to the sump, where, having passed through a gauze screen, it is returned to the reservoir by the lower, and deeper, gears in the oil pump. These gears draw oil from the sump via the scavenge pipe located in the lowest point of the crankcase. This pipe incorporates a non-return valve. Owing to the capacity of the scavenge side of the pump being greater than that of the feed gears, a mixture of oil and air will be seen to enter the reservoir from the return pipe.

If oil pressure exceeds the intended maximum, a release valve opens in the crankcase, passing surplus oil directly to the scavenge side of the pump en-route to the reservoir.

At the crankcase oil pipe connection the return pipe is tapped to provide oil at low pressure for the valve rocker gear. This pipe is connected to a union at the rockerbox and from this source oil is fed to the hollow rocker spindles. The rockers are drilled to provide a positive feed to the push rod ball pins and cups.

Incorporated in the return pipe is a cartridge-type filter on B25 models only.

CHANGING THE OIL AND CLEANING THE FILTERS

New or reconditioned engines must have the oil changed at 250, 500 and 1,000 mile (400, 800, 1,500 km.) intervals during the running in period and thereafter at every 4,000 miles (6,500 km.). The oil should be drained when warm as it will flow faster and carry impurities from the reservoir.

Oil may be drained from the frame reservoir after removing filter "C" and plug "B" (Fig. A3), but in order to gain access to plug "B" it is necessary to remove the right side panel (B50MX excepted). Make up a suitable chute from stiff cardboard to catch the oil and guide it into a receptacle capable of holding at least 6 pints (3·5 litres). Clean filter "C" in petrol before replacing.

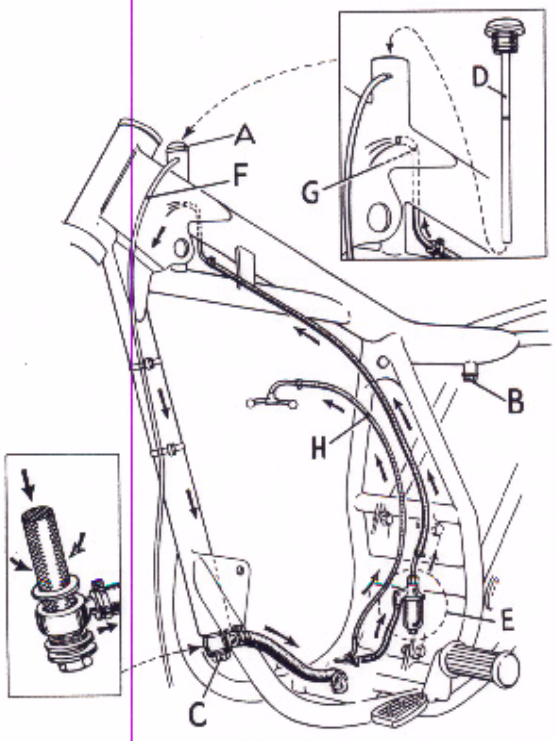


FIG. A3.

FIG. A4. *External oil filter.*

To clean the external filter in the return oil line of B25 models, unscrew the centre bolt to withdraw the bowl. Extract the filter cartridge, making sure that the sealing washers are retained, and wash it in petrol. However, if the cartridge is badly contaminated it must be renewed. Clean the bowl and filter body and re-assemble the unit, using new sealing rings if the old rings show signs of deterioration.

After ensuring that all unions, etc., are fully tightened the system may be refilled with fresh oil (see recommendations on Page A4) through filler orifice "A" (Fig. A3). Do not exceed the level shown on the dip-stick as an air space above the oil is essential for correct breathing. If this level is exceeded oil will be blown out of breather tube "F". Before starting the engine, pour ½ pint of oil into the sump. This can be done by removing the push rod inspection cover on the right side of the rockerbox.

OIL PRESSURE AND NON-RETURN VALVES

Pressure release valve

A constant oil pressure is maintained by the release valve situated on the front right side of the crankcase.

To prevent oil pressure becoming excessive, the valve opens and releases excess oil direct to the crankcase from where it is returned to the reservoir.

The valve is pre-set at the Works to open at a pressure of 80—100 lbs. p.s.i. (B25), or 45—50 lbs. p.s.i. (B50). This setting must not be altered. However, after prolonged service the spring does tend to weaken and the whole assembly must then be renewed since its component parts are not available separately. All pressure release valves are selectively assembled and tested before being released from the factory.

Unscrew the valve using a 1" A.F. spanner applied to the larger of the two hexagons. Ensure that the sealing ring is fit for further use.

The valve must be refitted to the crankcase with a torque of 25 lbs. ft.

Non-return valves

The feed side non-return valve consists of a ball and spring and is located in the inner timing cover (see Fig. A5). After unscrewing the retaining plug, the valve spring and ball may be removed for examination.

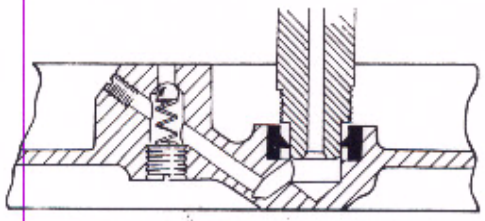


FIG. A5. *Non-return valve.*

Whilst changing the oil it is wise to check the scavenge pipe non-return valve for correct operation. Using a piece of wire, push the ball up off its seating and allow it to drop of its own weight. If the ball will not drop it indicates a build-up of sludge which can usually be cleared by immersing the pipe in petrol for a short period.

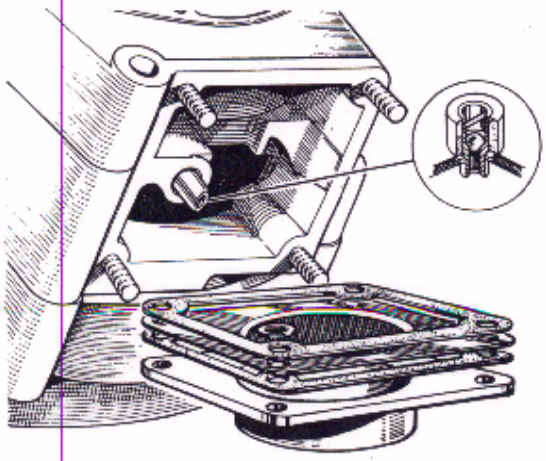


FIG. A6. *Sump filter.*

Low oil pressure

Low oil pressure is dangerous since insufficient oil will be delivered to the engine components The possible causes of low pressure are:—

(1) Insufficient oil in the reservoir. Check the level and the return after replenishing. If the return is correct it will show as a mixture of oil and air issuing from the return pipe.

(2) Reservoir and sump filters partly blocked, preventing the free passage of oil.

(3) Badly worn oil pump or big-end bearing in need of attention.

(4) Worn pressure release valve.

Crankcase oil pipes

The oil pipes are threaded into the crankcase beneath the engine and are secured by locknuts. Periodically, these nuts must be checked for tightness.

Crankcase breather

The engine breather is automatic, being incorporated in the camshaft. The camshaft is drilled along its length and a drilling in the inner cover camshaft bush corresponds with a similar drilling in the camshaft itself. At every revolution of the engine, pressure from within the unit is permitted to escape to atmosphere through the short breather pipe fitted adjacent to the clutch cable abutment.

The purpose of the breather is to release pressure that would otherwise build up within the engine causing lubrication problems and oil leaks. Therefore, it is most important that a regular examination of the breather pipe be made to ensure that it is clear and functioning correctly.

CONTACT BREAKER

The contact breaker is situated within the outer timing cover and it is essential that no engine oil enters the housing. To prevent this, an oil seal is pressed into the inner timing cover behind the auto-advance unit.

Lubrication of the contact breaker cam and the auto-advance unit pivot points, however, is necessary.

To gain access to the auto-advance unit the contact breaker plate must be removed. Scribe a mark across the plate and housing so that the plate may be replaced in exactly the same position. Take out the fixing screws and withdraw the contact breaker plate.

The bob-weight pivot points of the auto-advance unit must be lightly oiled at intervals of 2,000 miles (3,000 km.).

After lubricating, replace the plate to the mark, but if the ignition timing has been upset, follow the instructions for retiming on page B20.

The contact breaker heel is lubricated by a felt wick which must be very lightly greased every 2,000 miles (3,000 km.).

Every 2,000 miles (3,000 km.), the auto advance unit cam bearing must be lubricated with thin oil applied at the slot in the cam. Turn the engine until the slot is at the top, and allow time for the oil to penetrate.

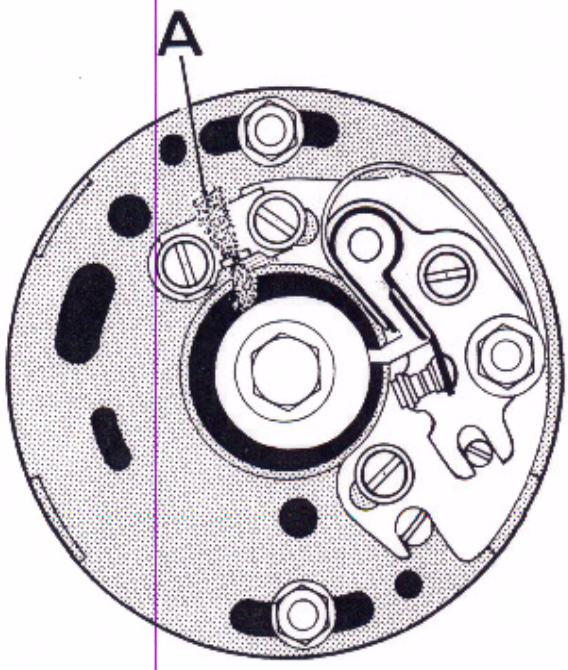


FIG. A7. *Contact breaker.*

GEARBOX LUBRICATION

The gearbox, having its own oil bath, is independent of the engine for lubrication but the oil level must be checked and any loss due to leakage made good.

The layshaft gears run in the oil bath and oil carried by or thrown off these gears lubricates the mainshaft gears, bearings and bushes.

To drain the gearbox, take out the filler plug/dipstick on top of the gearbox ("D", Fig. A8), then remove the drain plug underneath ("E") draining the oil into a suitable receptacle.

After draining, replace the drain plug, having made sure that the rubber "O" ring is in good condition.

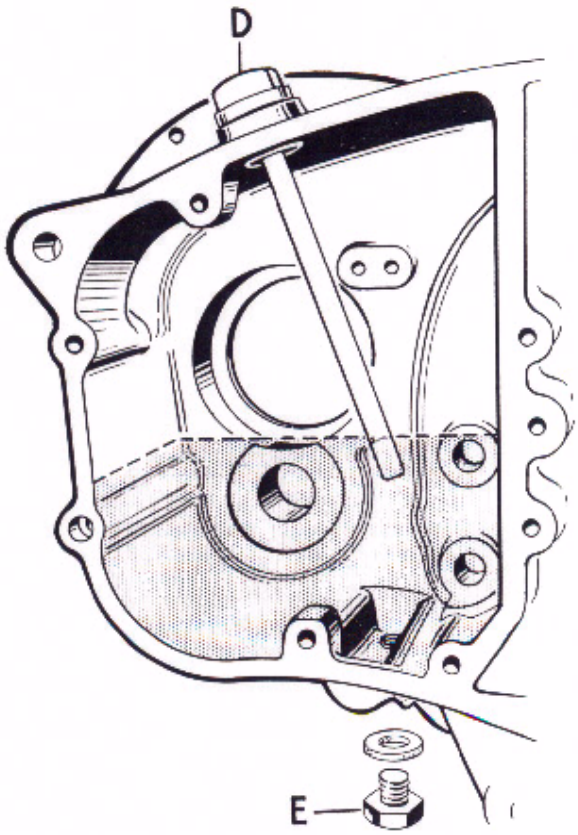


FIG. A8. *Gearbox oil level.*

Fill the gearbox with oil and check the level with the dipstick, which should be screwed home.

Recommended oils are given on page A4, capacity on page GD12 and checking frequency on page A2.

PRIMARY DRIVE
(B25 Models)

Like the gearbox, the primary chaincase is independent of the engine lubrication system but the level of oil must be checked every 1,000 miles (1,500 km.) and the oil bath drained and refilled every 4,000 miles (6,500 km.). Draining procedure is the same as for B50 models, described below.

PRIMARY DRIVE
(B50 models)

On B50 models the primary chaincase oil level is maintained by oil mist entering the compartment past the drive side main bearings. The oil finds its level and returns to the sump through filters fixed in the crankcase wall.

Therefore, periodic checking of the oil level is not called for, but it must be remembered that oil drained from the chaincase at oil change intervals must be replaced before further running to avoid damage to the primary transmission assembly. Use a suitable engine oil—see page A4.

To drain the oil, take out the chain inspection cap ("J", Fig. A9) at the top of the case and the drain screw "N".

Cap "H" is only removed to enable clutch adjustments to be carried out.

After draining, replace the drain screw, take out level screw "M" and pour oil through the inspection cap hole until it commences to run out of the level screw hole. Replace the level screw and inspection cap. The machine must be upright and on level ground when this operation is carried out to ensure correct level of oil.

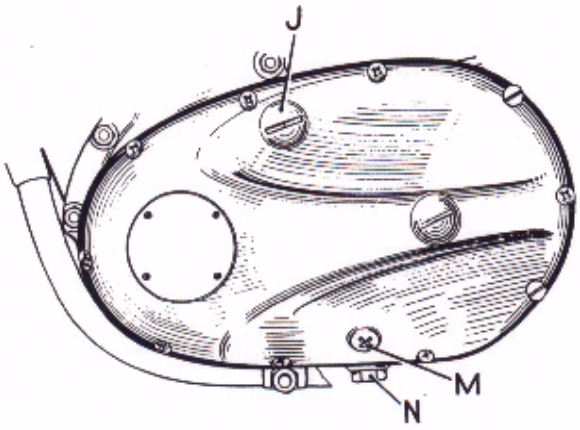


FIG. A9. *Primary drive lubrication.*

Oil containing molydbenum disulphide or graphite must not be used in the primary chain-case. Vegetable-based oil must not be used either. (see page A4).

FRONT FORK

The oil contained in the fork legs not only lubricates but acts as the damping medium. Because of the latter function, it is essential that the amount of oil in each fork leg is exactly the same.

The oil should be changed every 10,000 miles (15,000 km.), but some owners may not cover this mileage in a year, in which case it is suggested that the oil be changed every twelve months.

To drain the oil, unscrew the top cap nuts and drain screws at the lower end of the sliding members. Allow the oil to drain out, but take care to prevent oil dripping onto the tyre. Then, whilst standing astride the machine, apply the front brake and depress the forks a few times to expel any drops of oil remaining in the system.

Replace the drain screws, and pour oil into each fork leg. (See page A4 for recommended oils and page GD12 for capacity.)

SWINGING ARM

Early models are not fitted with grease nipples for greasing the swinging arm bearings, but sufficient grease is packed around the bearings on assembly to last a very considerable mileage, at least until a complete overhaul is required.

Machines fitted with grease nipples should have the bearings greased at intervals of 2,000 miles.

WHEEL BEARINGS

The wheel bearings are packed with grease on assembly but require re-greasing at intervals of 10,000 miles (16,000 km.).

The bearings must be removed as described on pages F4 and F5. After removal, the bearings must be washed thoroughly in paraffin and, if possible, an air line should be used to blow out any remaining grit or paraffin.

Repack the bearings with fresh grease (see recommendations on page A4) and reassemble them into the hubs. Do not over-lubricate, and avoid handling the brake shoes with greasy hands.

CONTROL CABLES

Exposed sections of inner cables should be lubricated periodically (see page A2). This may be done either by greasing or with an oil can.

The most satisfactory way, however, is to induce a flow of oil between the inner cable and casing by using a proprietary cable lubricator in conjunction with an air line or tyre inflator.

SPEEDOMETER AND TACHOMETER CABLES

The speedometer and tachometer cables must be lubricated to prevent premature failure of the inner wire. However, care must be taken to avoid

over-greasing, which will result in lubricant entering the instrument head. Unscrew the cable ferrule at the instrument end to withdraw the inner wire, and apply grease sparingly to all but the top six inches (15 cm.).

REAR CHAIN

The best method of lubricating the rear chain is to remove the chain every 2,000 miles (3,000 km.), wash it thoroughly in paraffin and allow to drain. Immerse it in a bath containing one of the many special preparations available for the purpose, and wipe off surplus lubricant before replacing the chain on the machine.

When replacing, make sure that the spring clip of the connecting link has its closed end facing the direction of travel of the chain (i.e. forwards on the top run).

INDEX

INDEX *(continued)*

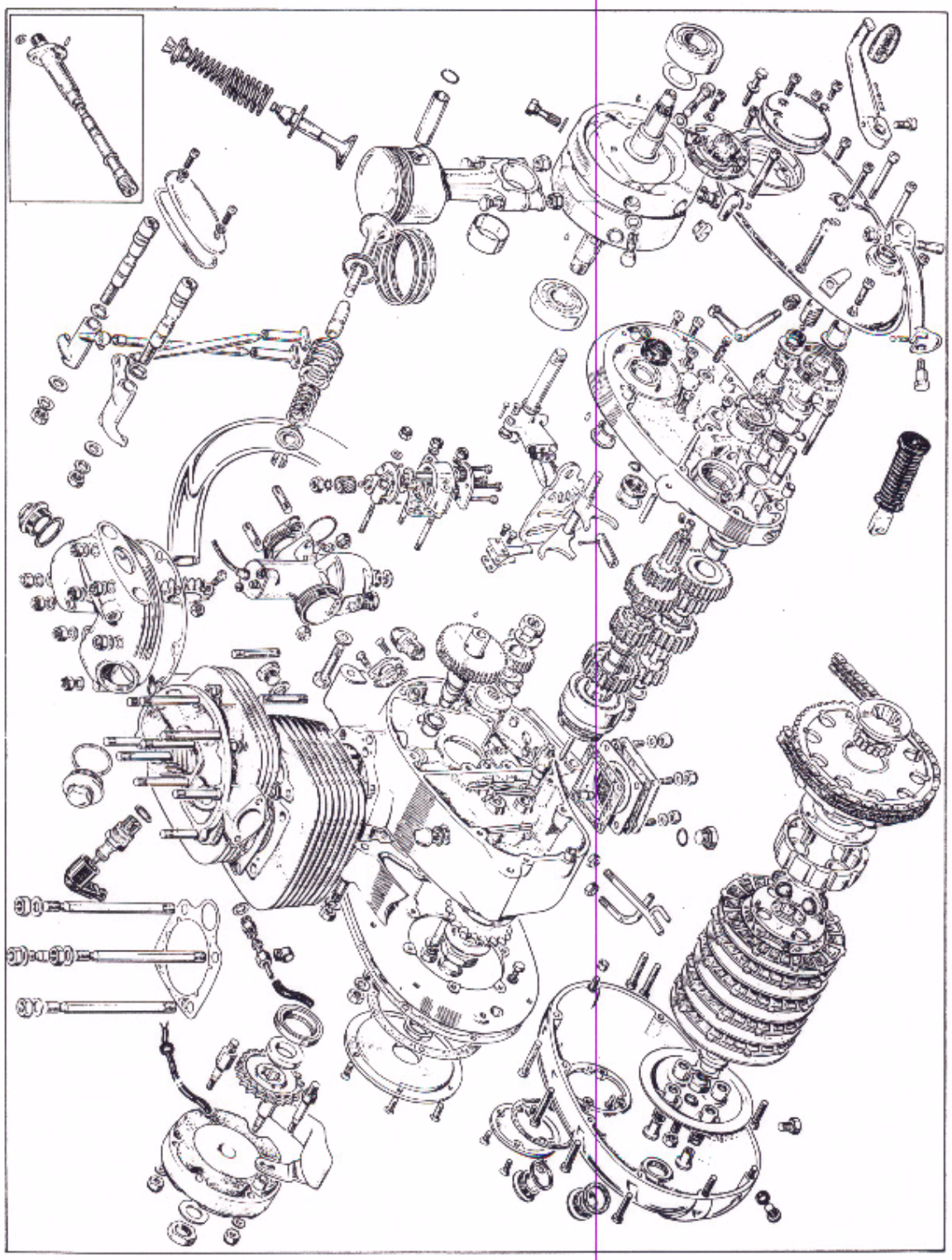


FIG. B1A. B25 *engine exploded.*

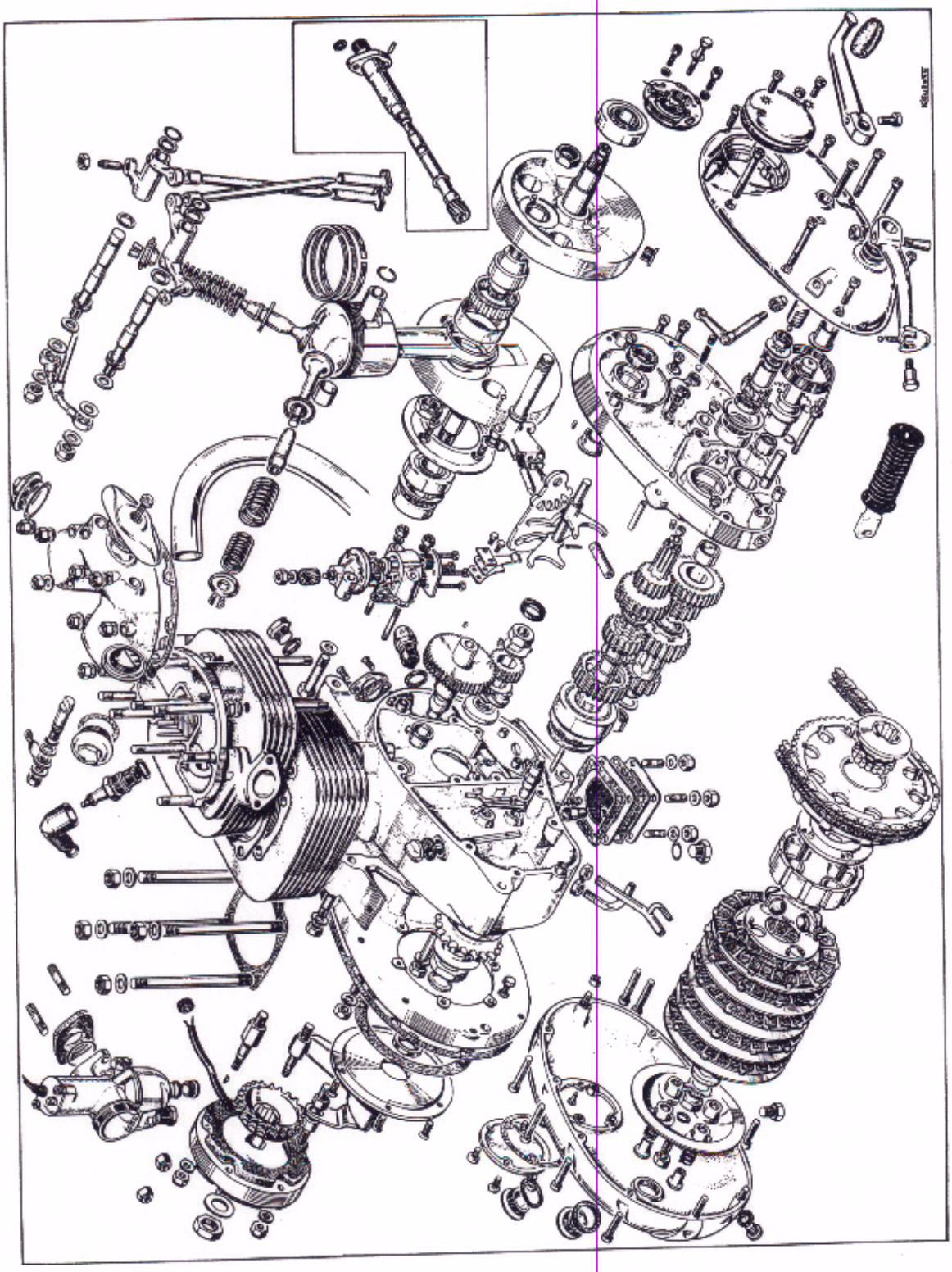


FIG. B1B. B50 *engine exploded.*

DESCRIPTION

B50 models

The B50 o.h.v. four-stroke engine is of the unit construction type, having a single cylinder barrel incorporating an austenitic iron liner.

The aluminium alloy slipper piston has two tapered compression rings and a two-piece scraper ring and is fitted to the H-section steel connecting rod which employs a needle roller bearing big-end assembly.

Two balanced flywheels (with crankshafts) and the crankpin are held together by two large nuts, the unit revolving in three crankcase bearings. The right flywheel is fitted with a centrifugal oil sludge trap.

The aluminium alloy cylinder head has cast-in, heavy duty cast-iron valve seats and removable valve guides. Housed within the rocker box are two valve rocker spindles, carrying the inlet rocker at the rear and the exhaust rocker at the front.

The camshaft revolves in two bushes, one of phosphor bronze and the other of sintered bronze.

Contained within the primary drive case on the left side of the crankcase are the clutch assembly, primary chain and alternator. The alternator unit consists of an encapsulated stator, mounted on three studs, and a rotor secured to the drive-side engine shaft. The chaincase contains an oil bath fed by the engine lubrication system.

A vertically mounted oil pump of the double gear type is driven from a worm gear on the timing side crankshaft and supplies oil to the big-end assembly, piston, cylinder walls and the timing gears.

The four-speed, constant mesh gearbox, at the rear of the right half of the crankcase, is independent of the engine lubrication system and contains its own oil-bath.

Power from the engine is transmitted through the engine sprocket and duplex primary chain to the clutch assembly which has a built-in cush drive. Here the drive is taken up by the bonded friction plates and is transmitted through the gearbox to the final drive sprocket.

B25 Models

Although being of smaller capacity, the B25 engine is similar in construction to the B50. The most noticeable differences are in the valve rocker gear and crankshaft assembly. The valve rocker spindles are eccentric, and valve clearances are adjusted by rotating the spindles which are secured by locknuts at their left ends.

The crankshaft is a one-piece forging with bolt-on flywheels, and incorporates a centrifugal sludge trap at the right side. The aluminium alloy connecting rod has a shell-type big-end bearing. Two main crankcase bearings are used, and the primary drive oil bath is completely independent of the engine lubrication system.

DECARBONISING

Decarbonising or "top overhaul" as it is sometimes called, means the removal of carbon deposits from the combustion chamber, piston crown, valve heads and inlet and exhaust ports, and to restore a smooth finish to these surfaces. Obviously, whilst the upper portion of the engine is dismantled for this purpose, opportunity should be taken to examine the valves, valve seats, springs, guides, etc., for general wear and tear, hence the term "top overhaul."

Carbon formed by combustion of the fuel mixture within the engine is not harmful provided that an excessive deposit is not allowed to build up. Any excess deposit will reduce engine efficiency.

The usual symptoms indicating the need for decarbonisation are an increased tendency for the engine to "pink" (a metallic knocking sound when under load), a general decrease in power and a tendency for the engine to run hotter than

usual. An increase in fuel consumption may also be apparent.

PREPARING TO DECARBONISE

Perfect cleanliness is essential to ensure success in any service task, so before starting a job such as this, make sure that you have a clean bench or working area on which to operate and room to place parts as they are removed.

Before commencing work the following equipment must be available:—

Suitable spanners.
Scrapers.
Feeler gauges (·008" & ·010").
A supply of fine grade emery cloth.
Jointing compound or cement.
Valve grinding tool No. 61-5035.
Coarse and fine grade grinding paste.
Valve spring compressor No. 61-3341.
Clean engine oil.
Two short lengths of square section hardwood to support the piston.
Top overhaul gasket set:—
No. 00-3174 (B50)
No. 00-3168 (B25).
Gudgeon pin circlips (2):—
No. 66-0954 (B50).
No. 70-6869 (B25).
Valve springs (set):—
Nos. 65-2494 (outer) and 65-2495 (inner) (B50).
Nos. 71-2223 (outer) and 40-1007 (inner) (B25).
A supply of paraffin and clean rag.

The fuel tank must be removed in order to gain access to the cylinder head (see page D.10).

Release the engine steady stay bolt at the cylinder head bracket and push the stay upwards clear of the working area. Remove the carburetter from the cylinder head, leaving it suspended from the throttle cable, and detach the complete exhaust system. Disconnect the rocker oil feed and take out the spark plug.

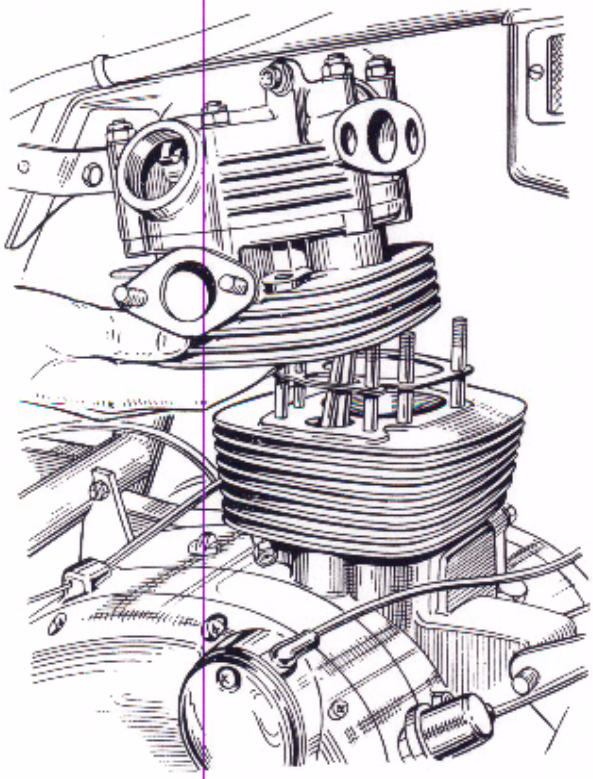


FIG. B2. *Removing the cylinder head and rocker box* (B25).

Removing the Cylinder Head and Rocker Box (B25 Models)

The rocker box assembly should remain in position until the cylinder head has been removed from the engine. Set the piston at top dead centre on the compression stroke (both valves closed) and release the six nuts retaining the cylinder head. Rotate the head about the push rods so that it will clear the frame, and lift it off the engine.

The rocker box may be removed from the cylinder head once the assembly is on the work bench.

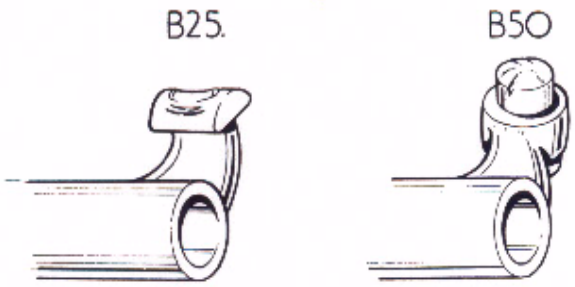


FIG. B3. *Worn valve rockers.*

Removing the Cylinder Head and Rocker Box (B50 Models).

Clearance between the rocker box and frame top tube is not sufficient to allow the rocker box or cylinder head to be removed unless the engine is first taken out of the frame. Removal and replacement of the engine unit is described on page B13.

Once the engine is out of the frame, the cylinder head and rocker box may be removed in the same manner as for the B25, described above.

Valve rockers

Figure B4 shows rocker arms which have been subjected to a great deal of wear, making correct valve clearance difficult to determine. During their manufacture the pads (B25) and pins (B50) are case-hardened and no attempt should be made to grind them smooth. If wear of this nature is apparent new parts must be fitted.

If the rockers and spindles are dismantled take care to renew any damaged washers. B50 rocker spindles are fitted with rubber sealing rings which must be in good condition. The rings must be renewed if damaged.

Refer to Figs B4 when reassembling.

Pushrods

Examine the push rod end cups to see if they are chipped, worn or loose, and check that the rods are not bent by rolling them on a flat surface such as a piece of plate-glass. If any of these faults are evident the rod(s) must be renewed.

Removing the valve springs

Using service tool No. 61–3341 (valve spring compressor), compress each spring until the split collets may be removed. The valve springs and top collars may now be lifted from the valve stems.

The springs may have settled through long use and they should therefore be checked in accordance with the dimensions given on page GD2 (B25) or GD6 (B50).

If the springs have settled appreciably, or there are signs of cracking, replacements must be fitted.

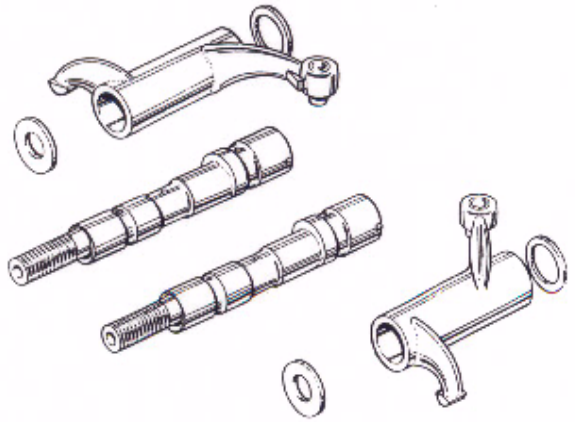


FIG. B4A. *Valve rocker assembly* (B25).

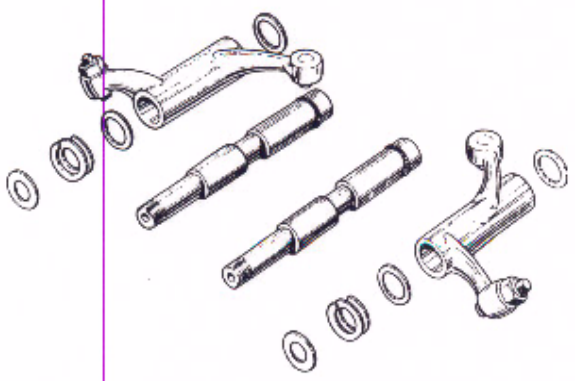


FIG. B4B. *Valve rocker assembly* (B50).

Valve guides

An old valve guide may be driven out with service tool No. 61-3382 but the cylinder head must first be heated in a hot oven or by submersion in hot water. The new guide may be driven in with the same punch whilst the head is still warm. Note that the exhaust guide is counterbored at its lower end.

Whenever new guides have been fitted, each valve seat must be refaced with a piloted valve seat cutter, to ensure that the seat is concentric with the guide bore.

Valves

Check the valves in their guides; there should be no excessive side-play or evidence of carbon build-up on that portion of the stem which operates in the guide. Carbon deposits may be removed by careful scraping and very light use of fine-grade emery cloth, but if there are signs of scoring on the valve stems, indicating seizure, both valve and guide must be renewed.

Valve heads may be refaced on a valve refacer (possessed by most dealers) but if pitting is deep or the valve head burnt, a new valve must be fitted and ground-in.

The valve seats in the cylinder head are unlikely to require attention, but if they are marked, they must be refaced with valve seat cutter No. 60–1832 (small), 60–1833 (medium) or 60–3769 (large) used with cutter holder and pilot set No. 60–1863. The seat angle is 45°.

Sometimes, when an engine has been decarbonised many times, valves become "pocketed". When the valve head and seat are below the surface of the combustion chamber, so impairing efficiency of the valve and affecting gas flow, the "pocket" (area "A", Fig. B5) must be removed with a special blending cutter (No. 60-1835, small or 60-1836, large) before recutting the seat or grinding-in the valve.

Removing carbon deposits

Removal of carbon may be carried out with scrapers or rotary files, but whichever method is used great care must be taken to avoid scoring the soft metal of the cylinder head and piston crown. A stick of tinsmiths solder, flattened at one end, provides an ideal scraper.

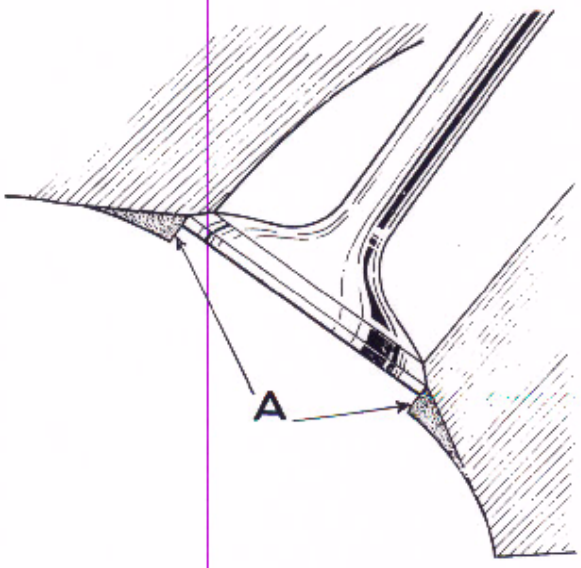


FIG. B.5. *Pocketed valve.*

If the cylinder barrel is not to be removed, bring the piston to the top of the bore, and, after plugging the push rod opening with clean rag, proceed to remove carbon from the piston crown.

Always leave a ring of carbon around the edge of the piston crown and around the top of the cylinder bore. This will help to provide an additional seal.

After cleaning the piston crown, rotate the engine to lower the piston and wipe away loose carbon from the cylinder wall.

The cylinder barrel and head joint faces must be cleaned, care being taken not to cause damage with the scraper. Score marks will result in gas leakage, loss of compression and burning of the cylinder head face.

Do not attempt to clean aluminium alloy parts in caustic soda solution.

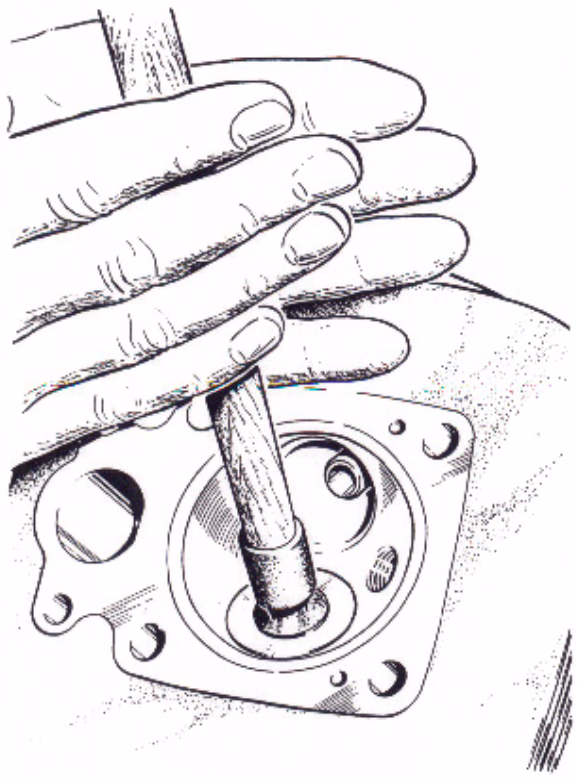


FIG. B.6. *Grinding-in valve.*

Valve grinding

If the valves have been renewed or refaced they must be lightly ground-in to their seats to ensure a gas-tight seal.

This operation is carried out only after all carbon deposits have been removed from the combustion chamber, inlet and exhaust ports.

Having decarbonised, smear a small quantity of fine grinding paste around the seating face of the valve and return the valve to its seat.

Now, using service tool No. 61-5035, rotate the valve backwards and forwards, maintaining steady pressure. Every few strokes, raise the valve and turn it to a new position. A light spring inserted under the valve head greatly assists in raising the valve, enabling it to be repositioned.

Grinding must be continued until the mating surfaces of both the valve and seat show a uniform matt finish all round.

Note:—Prolonged grinding-in of the valve does **not** produce the same results as recutting the seat and must be avoided at all costs.

Reassembling the cylinder head

Before reassembling the valves and springs all traces of grinding paste must be removed from both valves and valve seats.

Smear each valve stem with clean engine oil and replace the valves in the head.

Fit the spring cup, valve springs (with close coils at the bottom), and top collar over each valve stem, then compress the springs with service tool No. 61–3341 to allow the split collets to be inserted in the top collar. A little grease on the valve stem will assist in keeping the collets in position as the compressor is released. Make sure that the collets are correctly seated in the valve stem recesses by tapping the valve stem lightly with a copper hammer.

Cylinder barrel

Unless the condition of the engine indicates that the piston, piston rings or cylinder bore require attention, the cylinder barrel should not be disturbed.

If the bore is worn it may sometimes be detected by placing the fingers on top of the piston and attempting to push the piston backwards and forwards in the plane of flywheel rotation. Symptoms indicating worn piston rings include heavy oil consumption and poor compression, but only if the valves are known to be in good order.

Excessive piston slap when warm may indicate a worn bore or severe damage as a result of seizure.

The cylinder bore may be measured for wear with a suitable dial gauge, after moving the piston to the bottom of the bore.

Removing cylinder barrel

To remove the cylinder barrel, rotate the engine until the piston is at the bottom of its travel, then lift the barrel upwards until the piston emerges from the base of the bore. Steady the piston as it comes free from the cylinder so that it is not damaged by contact with the crank case mouth. As soon as the cylinder has been withdrawn, cover the crankcase mouth with a clean rag to prevent the entry of foreign matter.

Examine the cylinder carefully for wear. If a deep ridge has formed at the top of the bore or the bore shows score marks, the barrel requires reboring.

The cylinder barrel on both the B25 and B50 is fitted with an austenitic iron liner, enabling reboring for use with oversize pistons. Recommended oversizes for the both models are ·020" and ·040".

It is not necessary to remove the piston unless it requires replacement or further dismantling of the engine is to be carried out.

Removing the piston

Prise out one of the gudgeon pin circlips using a suitable pointed instrument, but before attempting to push out the gudgeon pin, the piston must be warmed in order to expand the material

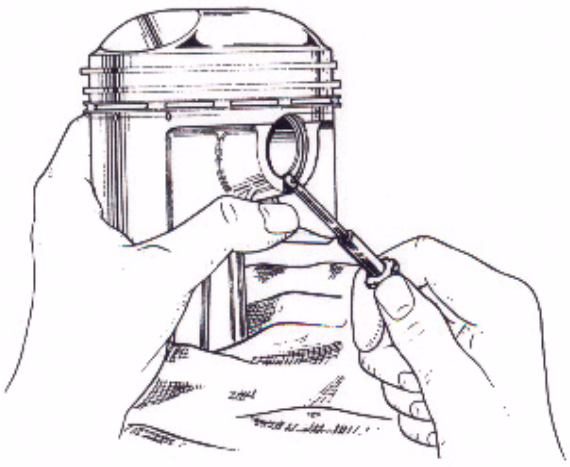


FIG. B7. *Removing a gudgeon pin circlip.*

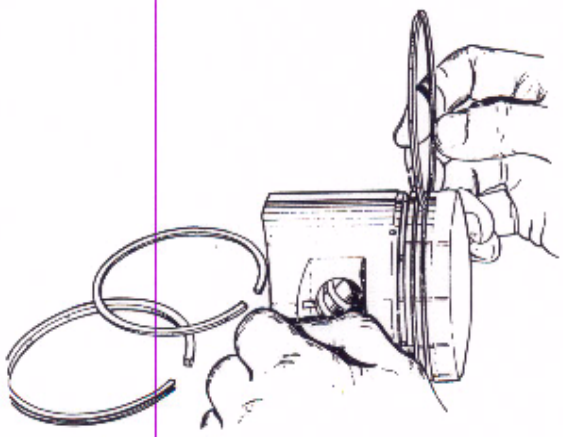


FIG. B8. *Checking piston ring grooves.*

of which it is made. In this way, the gudgeon pin may be removed without risk of damaging the piston or connecting rod. Either wrap the piston in a rag that has been soaked in hot water, or apply an electric iron to the piston crown.

Piston rings

The outside face of each ring should possess a smooth metallic surface. Any sign of discolouration means that the ring is in need of replacement.

The rings should also retain a certain amount of "springiness" so that when released from the barrel the ends of each ring lie at least ¼" apart.

Each ring should be free in its groove but with minimum side clearance. If the rings tend to stick in the grooves, remove them and clean out all carbon from the groove and the inside face of the ring. Care is necessary to permit only a minimum amount of movement when removing the rings as they are very brittle and easily broken.

A piece of a broken piston ring, ground as a chisel, is a useful tool for removing carbon deposits from the ring grooves.

To check the piston ring gaps, place each ring in the least worn part of the cylinder bore (at the bottom) and locate it with the top of the piston to ensure it is square in the bore.

Measure the gap between the ends of the ring with a feeler gauge. The correct gaps when new are ·009"—·013" (B25) and ·017"—·025" (B50). Although an increase of a few thousandths of an inch is permissible, any large increase to say ·040" indicates the need for a replacement ring.

It is advisable to check the gaps of new rings before fitting. If a gap is less than the specified minimum the ends of the ring must be carefully filed to the correct limit.

Both compression rings on B50 models are tapered on the outside face and their upper surface is marked TOP to ensure correct fitting. B25 models have a top compression ring of plain section and the second compression ring only is tapered. This is also marked TOP. If tapered rings are fitted upside down, oil consumption will become excessive.

Small-end bush

Small-end bush wear is normally very slight, but a worn bush will cause an unpleasant high-pitched tapping sound.

The gudgeon pin should be a good sliding fit in the bush, but if there is considerable up and down movement, the bush must be replaced. The B25 does not have a replaceable bush—the complete connecting rod must be replaced.

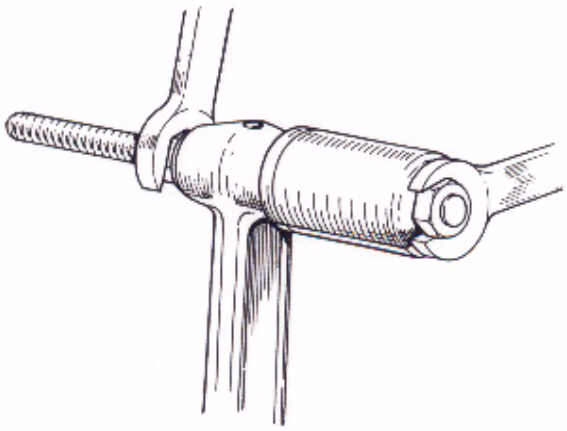


FIG. B.9. *Using Service-tool No. 61–3653 to remove small end bush (B50 only).*

Using service tool No. 61–3653, the bush may be changed in one operation by pushing the old bush out and, at the same time, pressing the new one in. The new bush must be correctly aligned with the oil hole in the connecting rod, and reamed to ·7503"—·7506" after fitting.

Reassembly after decarbonising

Scrupulous cleanliness must be observed when reassembling, and each component should be smeared with fresh engine oil before replacing.

Warm the piston before inserting the gudgeon pin and ensure that the piston is the correct way round before fitting. Always use new gudgeon pin circlips and make absolutely certain that they are securely fitted. A loose circlip will result in severe damage.

Fit a new cylinder base gasket and support the piston with two pieces of hardwood ($\frac{1}{2}$" square by 6" long) placed across the crankcase, under the piston skirt (see Fig. B10).

The piston ring gaps must always be equally spaced round the piston, that is, at 120 degrees apart, to restrict gas leakage through the gaps to a minimum.

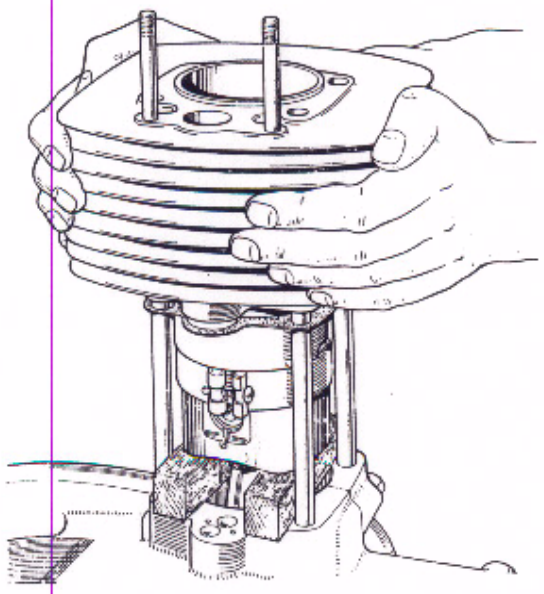


FIG. B.10. *Replacing cylinder barrel.*

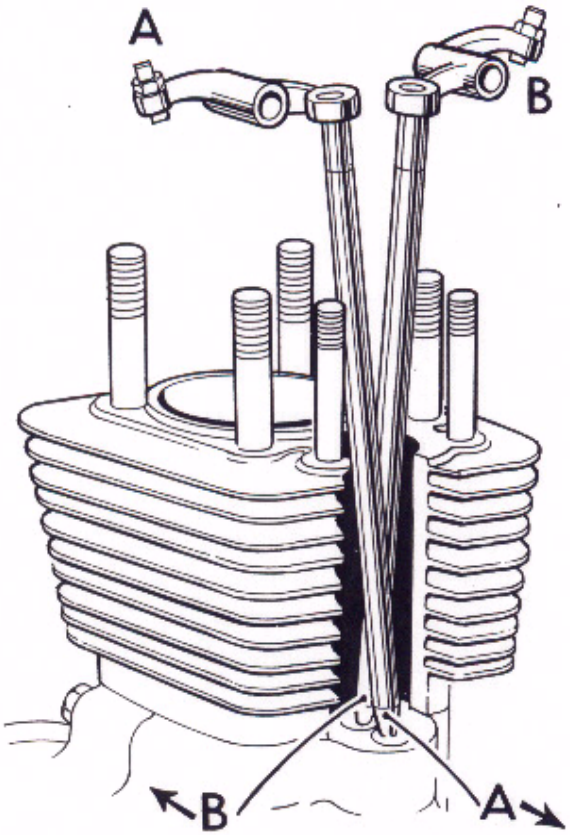


FIG. B11. *Location of pushrods.*

Using piston ring slipper No. 61–3682 (B25) or 61–6112 (B50) compress the rings so that the slipper is just free to rotate and refit the barrel. The slipper will be displaced as the piston enters the bore.

Take off the slipper and remove the hardwood supports, allowing the barrel to drop on to the crankcase.

Insert the two push rods down the barrel aperture, on to their respective tappets, the outer one operating the inlet valve (see Fig. B11).

Note that on B25 models only the top of the exhaust push rod is painted red for identification purposes and is very slightly shorter than the inlet rod. The push rods of B50 engines are identical.

Refit the rocker box assembly using a new gasket, and tighten the fixing nuts to 7 lbs. ft. using a torque wrench.

In order to avoid any strain on the cylinder head fixing nuts from valve spring pressure, the piston must be set at top dead centre on the compression stroke before attempting to refit the cylinder head assembly.

Check that the push rods are correctly located, place a new cylinder head gasket in position, and refit the head, complete with rocker box.

Now, using a torque wrench, tighten the six cylinder head fixing nuts to the figures given on page J1. It is necessary to use an extension of the type shown on page J2 to reach the nuts on the right side.

On B50 models only, the pushrod inspection cover may be refitted at this stage.

If, as in the case of the B50 model, the engine was removed for decarbonising, it may now be refitted. Follow instructions given on page B13.

Check the valve clearances as described below, and refit the sparking plug. Refit the carburetter, and tighten the fixing nuts to a torque 10 lbs. ft.

Reconnect the rocker oil feed using new sealing washers where necessary.

Replace the exhaust pipe and secure in position. Do not omit to tighten the silencer clip. Refit the engine steady stay and fuel tank.

CHECKING VALVE CLEARANCES

Valve clearances must be adjusted with the piston at top dead centre on the compression stroke (both valves closed). At this point valve clearances must be adjusted to · 008" (· 20 mm.) inlet and · 010" (· 25 mm.) exhaust.

The engine must be cold at the time of adjustment.

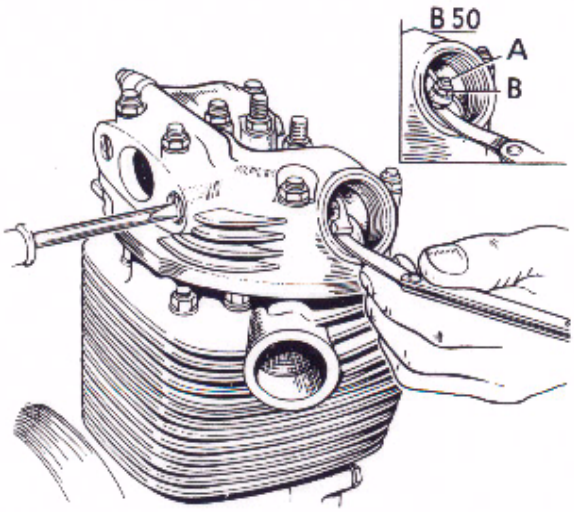


FIG. B.12. *Checking valve clearances.*

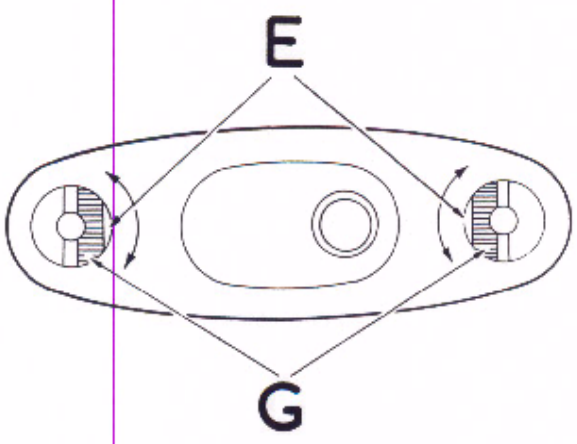


FIG. B13. *Valve rocker adjustment* (B25).

B50 models

If the clearances require adjusting slacken the locknut (*A*) and adjust the pin (*B*) until the correct gauge will just slide between the valve stem and pin (see inset, Fig. B12).

Holding the pin in its new position, retighten the locknut.

Check the clearance again to make sure that the setting has not altered whilst tightening the locknut, and refit the inspection caps.

B25 models

These engines have eccentric rocker spindles, valve clearances being adjusted in the following manner.

Having removed the pushrod inspection cover, slacken the spindle locknuts at the left side. Ideally, there should be at least one thread of the spindle visible past the locknut. If this is not the case, the spindle is not correctly positioned in the rocker box and must be turned clockwise using a screwdriver at the right side. Unless this operation is performed with the rockerbox removed, there will be resistance to turning from valve spring pressure.

Before adjustment, the flats milled on the right end of the rocker spindles ("E" Fig. B13) must face each other as illustrated. This is most important, as otherwise the pad of the rocker arm will not contact the valve stem centrally. Adjust valve clearances by turning the spindles, but ensure that correct clearances are achieved with the flats remaining in the shaded area ("G", Fig. B13).

When adjustments have been completed, secure the spindles with their locknuts and recheck the clearances.

Finally, replace the cover plate and gasket and the two inspection caps.

REMOVAL AND REPLACEMENT OF THE ENGINE UNIT

During removal of the engine unit, watch for any nuts or bolts which are found to be loose or have worn considerably. Such parts are no longer serviceable and must be replaced.

Examine the wiring for places where the insulation may have rubbed through and protect with a few turns of insulating tape. A bare wire could cause an electrical short-circuit which may set the machine on fire.

Procedure for removal of the engine unit is as follows.

(1) Remove the fuel tank—see page D.10.

(2) Remove the exhaust system. The silencer is secured to the frame at two points and may be detached once the two fixing bolts, and the exhaust pipe clamp, are released. Release the front engine bolt nut, so that the exhaust pipe may be withdrawn from the cylinder head in which it is a push fit.

(3) Take off the crankcase shield and right side panel, and drain the oil reservoir as detailed on page A6. Uncouple the rocker oil feed pipe and disconnect the flexible scavenge pipe from the crankcase pipe.

(4) Disconnect the generator, oil pressure switch (if fitted) and contact breaker leads from their snap connectors at the electric box and disconnect the high-tension lead from the sparking plug.

(5) On removal of the flange fixing nuts, the carburetter may be detached and tied out of the way. Leave the rubber connecting hose attached to the air cleaner box.

(6) Detach the engine steady stay from the bracket on the rocker box, and disconnect the exhaust valve lifter cable (if fitted).

(7) Remove the chainguard front extension (see page D.8.) and uncouple the rear chain. Detach the chain from the machine. Disconnect the clutch cable, using a suitable open-ended spanner as a lever on the operating arm.

(8) Slacken the footrest fixing bolt so that the right footrest may be swung down out of the way.

The engine bolts may now be released, and it will be noted that distance pieces are fitted between the engine and frame at the right side of the front and bottom bolts.

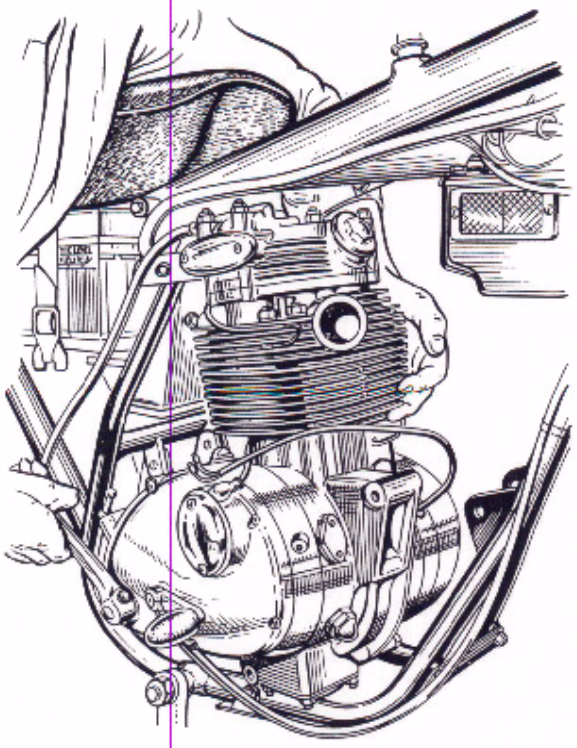


FIG. B.14. *Removing engine unit.*

Remove the rear right engine plate by releasing the top and bottom fixing bolts, and lift the engine unit out from the right side. See Fig. B.14.

Replace the engine in the reverse manner making sure that all nuts, bolts, and electrical connections are secure. Take care to replace the two distance pieces correctly (to the right of the engine), make a final check of all nuts and bolts, etc., before using the machine on the road.

TRANSMISSION

Description

Power from the engine is transmitted through the engine sprocket and primary drive chain to the clutch chainwheel, then via the clutch driving and driven plates to the cush drive or shock absorber unit and gearbox mainshaft.

The drive is then transmitted through the four-speed gearbox to the final drive sprocket and finally, to the rear wheel.

The clutch cush drive, as its name implies, smooths out the drive as the power impulses fluctuate.

The clutch, when operated correctly, enables the rider to stop and start his machine smoothly without stalling the engine, and assists in providing a silent and effortless gearchange.

Thus it will be evident that the satisfactory operation of one part of the transmission system is dependent on another. In other words, if one part is worn or faulty, it can very often prevent other parts from working properly.

DISMANTLING AND REBUILDING THE PRIMARY DRIVE

The following notes assume that the engine unit is isolated on a workbench, although attention to the primary drive and gearbox assemblies may be carried out with the engine installed in the frame. However, if this is to be the case, both footrests and the rear brake pedal (see page D10) must be taken off.

Removing primary drive cover

Drain the oil as described on page A6 and take out the fixing screws. The screws are of three different lengths and careful note should be taken of their respective positions to facilitate refitting. Break the joint by tapping the cover gently with a hide mallet, but have a suitable receptacle ready to catch any remaining oil.

Clutch dismantling

Remove the locking wire (B50 only) and the four spring retaining nuts and withdraw the pressure plate complete with springs and cups. The remaining clutch plates may now be taken out. If these are the only items requiring attention, the clutch need not be dismantled further.

So that the clutch centre nut may be unscrewed, the clutch centre and chainwheel must be locked together with service tool No. 61-3774, and a bar inserted through the connecting rod small-end. If the service tool is not available, or if the cylinder and piston are still in position, engage top gear and lock the gearbox sprocket with a length of chain in a vice. If the engine is still in the frame, apply the rear brake. Flatten the lockwasher beneath the clutch centre nut and unscrew the nut, which has a normal right-hand thread.

Take off the nut, lockwasher and distance piece, and withdraw the clutch push rod. Do not attempt to remove the chainwheel at this stage.

Generator removal

As the primary drive chain is endless, it is not possible to dismantle the clutch completely unless the generator and engine sprocket are removed. The generator comprises the rotor, fitted to the engine shaft, and the stator which is mounted on three studs around the rotor, both parts being detailed in section "G".

To remove the stator, release the three nuts and pull the generator lead through the rubber grommet in the front of the crankcase. Take care not to damage the stator casing when pulling the stator off its studs and note that the stator unit is fitted with the lead on the inside.

The primary chain tensioner may now be taken off. Note that a distance piece is fitted on the rear stud.

Bend back the tab of the lockwasher under the engine shaft nut and unscrew the nut. Pull off the rotor, wipe it clean of swarf, and store it in a clean place. Take out the Woodruff key from the crankshaft, and stick it to the rotor for safe keeping.

With extractor No. 61-3583, the clutch sleeve may be freed from the tapered mainshaft, enabling the clutch chainwheel, chain and engine sprocket to be withdrawn together (Fig. B15).

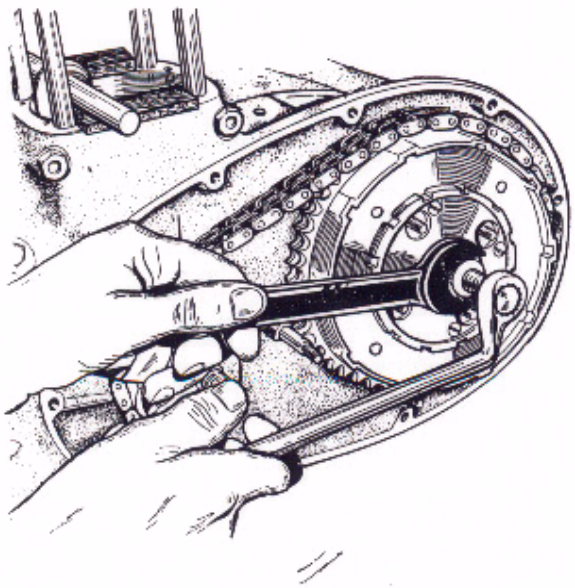


FIG. B.15. *Removing the clutch.*

Inspecting the clutch

The driving plates have segments of special friction material which are securely bonded to the metal. These segments must be complete, unbroken and not displaced. Even if there is no apparent wear or damage to the plates or segments, the overall thickness of each segment should be measured, and if the extent of wear is more than ·030" (·75 mm.), the plates must be replaced. Standard thickness is ·167" (4·24 mm.).

The tags on the outer edge of the plates should be a good fit in the chainwheel slots and must not be "hammered". If there are burrs on the tags the plates must be renewed.

The plain driven plates must be free from score marks and perfectly flat. To check flatness, lay the plate on a piece of plate glass; if it can be rocked from side to side, it is buckled and must be replaced.

Clutch centre and cush drive

To inspect the cush drive rubbers which are contained in the clutch centre, take out the four countersunk-head screws adjacent to the clutch spring housings and prise off the retaining plate

The rubbers must be firm and sound, and should not be disturbed unless wear or damage is evident.

When refitting the rubbers it will be found necessary to use a lubricant, in which case a liquid soap is recommended. **Do not use oil or grease.**

The clutch centre housing slots must be smooth and unmarked—damaged grooves will cause a jerky clutch action.

Clutch chainwheel

Examine the slots for wear; if they are corrugated or the teeth are hooked and thin, the chainwheel must be replaced.

Check the chainwheel roller bearing for up and down movement. Slight play is permissible, but if excessive, the rollers must be renewed.

Gearbox sprocket

Access to the gearbox sprocket is possible once the clutch assembly has been removed.

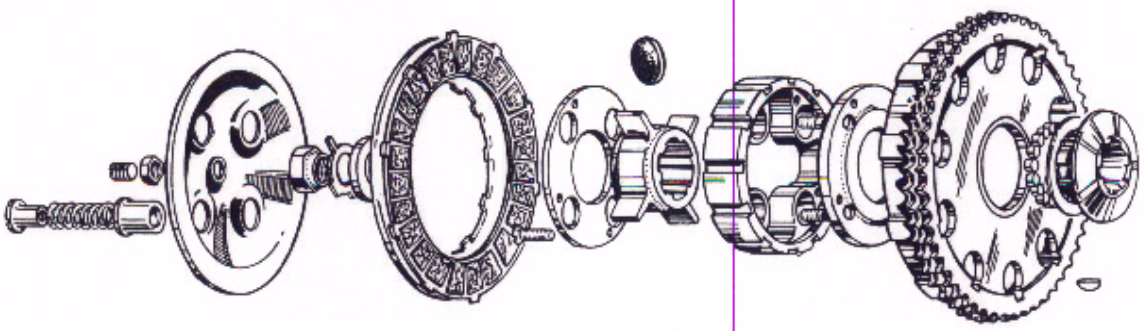


FIG. B16. *Clutch exploded.*

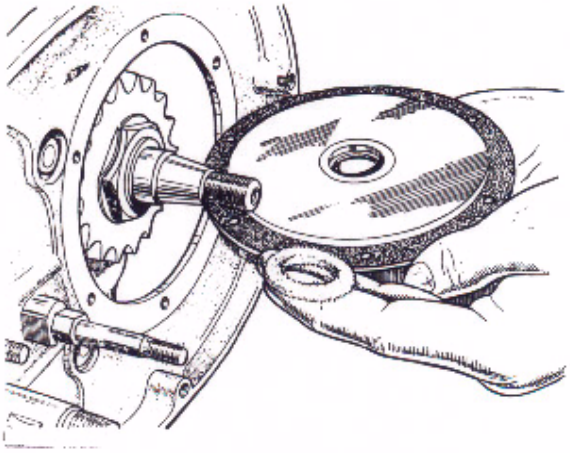


FIG. B.17. *Primary case back plate.*

Take out the six screws securing the circular plate at the rear of the primary case, break the joint and remove the plate with its oil seal. It will be noted that there is a small boss cast onto the rear of the plate—on reassembly this boss must be at the four o'clock position as it will otherwise foul the rear chain.

Look for signs of oil leakage down the back of the cover. If leakage is evident, change the oil seal, ensuring that it is fitted correctly with the lip of the seal to the inside of the primary case.

A felt washer is fitted between the circular plate and the sprocket fixing nut, preventing the entry of grit which may damage the oil seal. This washer must be renewed on reassembly.

If it is necessary to renew the gearbox sprocket, place a length of chain round the sprocket and lock in a vice or with a suitable bolt or, in the case of an engine still fitted in the frame, engage top gear and apply the rear brake. Flatten the tab washer and unscrew the retaining nut which has a normal right-hand thread. The sprocket may now be pulled off the gearbox sleeve pinion splines.

The gearbox oil seal is retained by a circlip, and may be renewed at this stage if it shows signs of leakage, but the sprocket boss must be examined for signs of wear. A worn sprocket must be replaced, though it may be possible to overcome slight wear by using fine emery cloth to rub the boss smooth. A sprocket that is "hooked" (see Fig. H3) must be renewed. Lightly oil the sprocket boss when replacing to avoid damage to the oil seal.

Refit the nut with a new lockwasher, and bend up the washer to lock the nut.

PRIMARY CHAIN ALIGNMENT

If any engine component such as the crankshaft, crankcase, gearbox mainshaft, engine sprocket, clutch hub, clutch chainwheel or inner timing cover has been renewed, true alignment of the primary chain must be re-established in order to avoid excessive wear of the chain and sprockets.

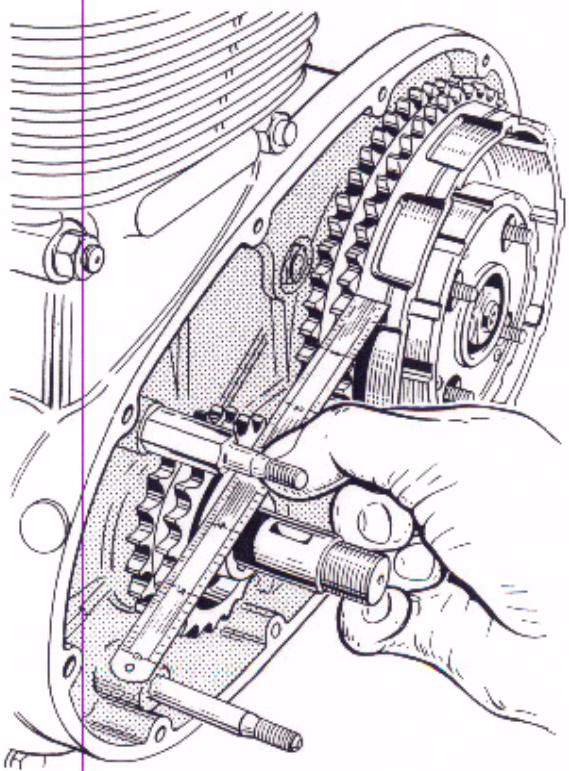


FIG. B.18. *Checking alignment of the primary drive.*

Rebuild the clutch assembly (see below) without the primary chain and fit the engine sprocket. Do not omit the engine sprocket distance piece, fitted to B25 engines only, which must be fitted with the chamfered side outwards.

Apply a steel rule or other suitable straight-edge across the face of the clutch chainwheel and engine sprocket teeth, as shown in Fig. B18. The straight-edge will make contact at three points if the sprockets are truly aligned.

If the sprockets are not in alignment, indicated by a gap between the straight-edge and engine sprocket if the straight-edge is applied to the clutch chainwheel only, shims to the value of this gap must be fitted behind the engine sprocket to bring the sprockets into line.

Part numbers and thicknesses of the various shims available are:—

B25:	·010" (71–1819)
	·015" (71–1820)
B50:	·015" (71–1630)
	·030" (71–1629)

Reassembling the primary drive

Remove the clutch assembly complete, with service tool No. 61–3583, if primary chain alignment has been checked, and pull off the engine sprocket.

If the clutch sleeve has been removed from the chainwheel, smear the sleeve with grease and place the twenty-five rollers in position. Slide the chainwheel over the rollers and fit the clutch centre over the splines of the sleeve.

Fit the primary chain around both clutch and engine sprocket, and screw service tool No. 61–3583 into position in order to provide means of holding the assembly.

Pick up the assembly in both hands and locate the sprockets over their respective shafts. (Fig. B19). Ensure that the gearbox mainshaft key is correctly located. Add the clutch centre nut distance piece and fit a new lockwasher. Ensure that the threads of the clutch retaining nut and gearbox mainshaft are free from grease, and apply a drop of "Loctite" to the threads of the mainshaft before fitting and tightening the nut to a torque of 60—65 lbs. ft.

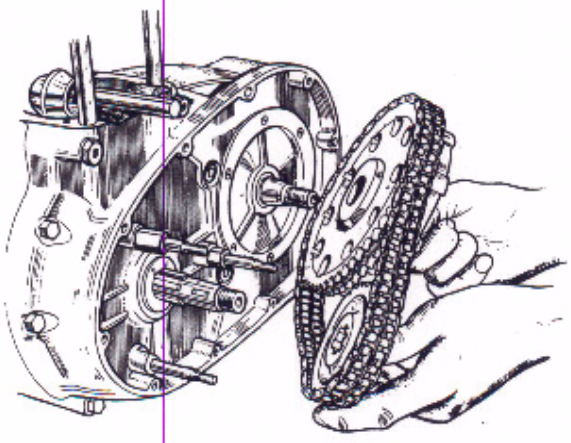


FIG. B.19. *Fitting primary drive.*

Pass the stator lead through the grommet at the front of the crankcase. Fit the rotor Woodruff key to the engine shaft, and push the rotor home with its marked face outwards. Locate the tag of the lockwasher and fit the nut, having first applied a drop of "Loctite" to the threads. Tighten the nut to 60 lbs. ft. and bend up the lockwasher.

Replace the primary chain tensioner, fitting the distance piece on the rear stud, behind the tensioner adjustment strap.

Fit the stator on to its studs with the lead on the inside at the front, and secure with the self-locking nuts. It is important that the air gap between the rotor and the stator pole pieces is equal all round. The gap may be checked with a ·008" feeler gauge. Any variation may be corrected by slackening the stator fixing nuts sufficiently to allow the stator to be tapped into the required position with a hide mallet.

Having refitted the stator, checked the air gap and tightened the three fixing nuts, slacken the

rearmost nut in order to adjust the primary chain. Adjust the chain tensioner to permit ¼" (6 mm.) free play on the top run of the chain midway between the sprockets, and tighten the stator nut firmly.

Replace the clutch plates, beginning with a friction plate, then a plain plate, and so on alternately, there being five plates of each type. Insert the clutch pushrod into the mainshaft.

Place the pressure plate in position and fit the four spring cups with springs, which should be of equal length (1·65" or 42·0 mm.). If the springs are found to have settled in service they must be renewed. Ensure that the location pips of the spring cups are properly located in the slots in the pressure plate.

Screw on the four spring nuts with the special screwdriver No. 61–3700 until the first coil of each spring is just proud of its cup.

If the springs are compressed excessively, the handlebar lever will be stiff to operate. Conversely, if spring pressure is insufficient the clutch will slip. Check the accuracy of the spring setting by declutching and depressing the kickstart lever, when it will be seen whether or not the pressure plate is running "true". If necessary, adjust each nut to correct any "run-out". On B50 models only, lock the spring retaining nuts in position with a length of copper wire.

When the spring setting has been determined the clutch movement can be adjusted by means of the central screw and locknut on the pressure plate. The pushrod must also be adjusted in this way so that the clutch operating lever on the timing cover lies at an angle of approximately 30° to the cover joint face.

Having completed assembly of the clutch, the primary cover may be refitted. Apply grease to each joint face, and, using a new gasket, fit the cover. Tighten the fixing screws evenly to a torque of 3·5—4·5 lbs. ft.

CONTACT BREAKER

The contact breaker assembly and auto-advance mechanism are contained within a circular compartment in the inner timing cover. The contact breaker points are mounted on a circular base plate, which is slotted at its circumference and therefore may be moved within fixed limits to provide a means of adjusting ignition timing. It is also possible to carry out fine timing adjustments by means of an eccentric screw, and the points gap is adjusted in a similar manner.

Mounted in a taper at the right end of the camshaft is the automatic advance/retard unit which consists of a pair of spring loaded bob-weights actuating the contact breaker cam. The unit provides automatic control of ignition timing, according to the needs of the engine. When the engine is stationary, the bobweights hold the cam in the fully retarded position, necessary for easy starting. As engine revolutions rise, so the bobweights are flung outwards, progressively advancing the timing until the fully advanced position is reached at a crankshaft speed of approximately 4,250 r.p.m. in the case of the B25 and 3,000 r.p.m. for the B50.

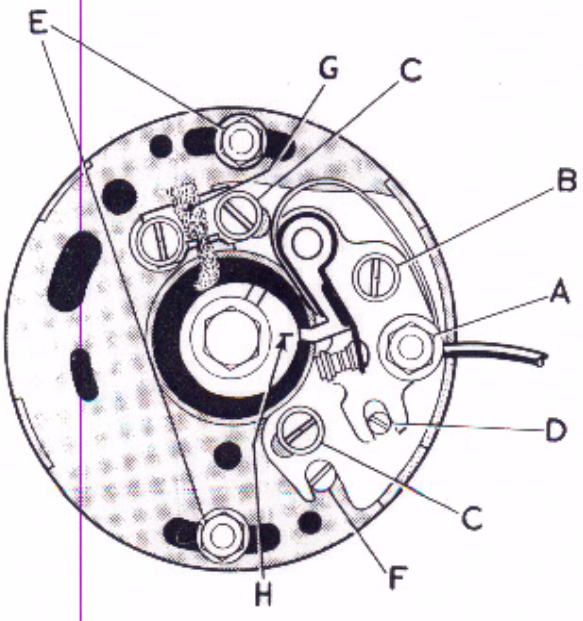


FIG. B20. *Contact breaker.*

An oil seal pressed into the inner timing cover prevents oil reaching the contact breaker housing, and the cam is lubricated by a felt wick which must be greased periodically (see page A8).

Contact breaker points

To change or inspect the contact points, which may be done without removing the backplate from the engine, unscrew and remove the screw "B", Fig. B20. Both moving and fixed contacts together with the points mounting plate may be taken off as a sub-assembly by pulling the moving contact from its pivot.

The contacts must be free from grease and oil. If they are blackened or burnt, clean with a fine carborundum stone or very fine emery cloth. Wipe away any traces of dirt or metal dust with a clean rag moistened with petrol.

Having refitted the points, it will be necessary to reset the points gap to ·015" (·38 mm.). Revolve the engine until the nylon heel is on the peak of the cam, indicated by a stroke ("H' Fig. B20), loosen screw "B" and move the fixed contact by turning the eccentric screw "D" to give the correct gap. Tighten screw "B" and recheck the setting.

It is advisable to check the ignition timing after carrying out any adjustment to the contact breaker points as any variation in the points gap will alter the timing. Increasing the points gap advances the timing; closing the gap retards the timing. Although this variation is very slight, it must be remembered that accurate timing is essential if optimum performance is to be achieved.

Details for checking the timing are given below.

Removing the contact breaker and auto-advance unit

Before removing the back plate scribe a mark across the plate and housing so that it may be replaced in exactly the same position, otherwise the ignition timing will have to be reset.

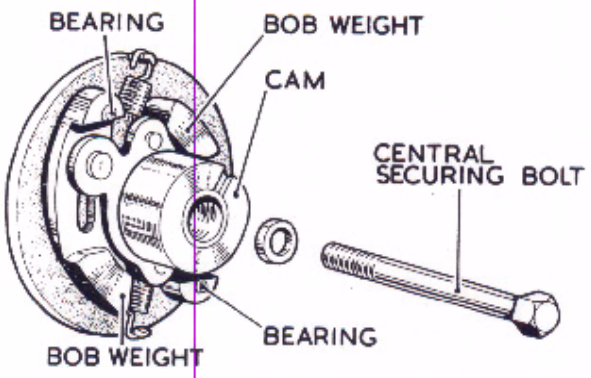


FIG. B21. *Automatic-advance unit.*

Disconnect the condenser lead at the electric box snap connector, unscrew the two pillar bolts ("E", Fig. B20) and take off the plate complete with contacts and lead.

To remove the auto-advance unit take out the fixing bolt, then free the unit from its taper.

IGNITION TIMING

Before carrying out any check on ignition timing, the contact points gap must first be verified and if necessary readjusted as described above.

Remove the sparking plug to enable the engine to be easily rotated. If the engine is in the frame, it will also help if top gear is engaged so that the engine may be turned by rotation of the rear wheel.

Piston position

Early engines are fitted with alternator rotors having one timing mark, later rotors have two marks. In the case of a later model, the mark opposite the keyway and identified by the figure "2" applies to B25 and B50 models.

Set the piston at top dead centre on the com-

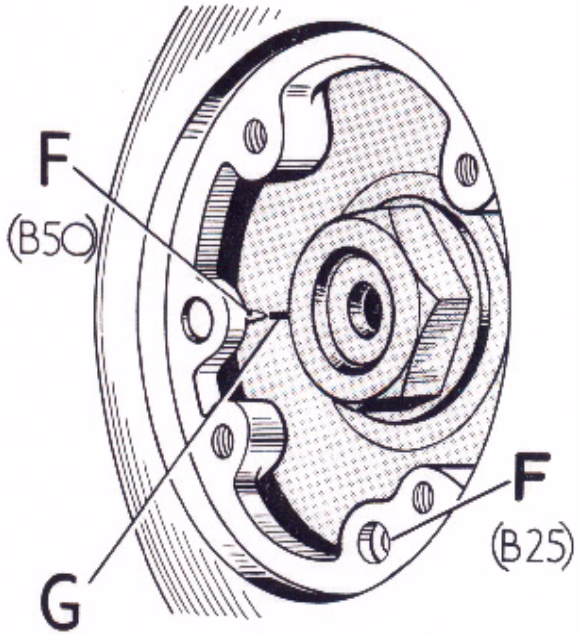


FIG. B22. *Ignition pointer positions.*

pression stroke (both valves closed), then turn the engine backwards until the pointer in the primary cover coincides with the line scribed on the rotor. It must be noted that there are two possible positions for the ignition pointer (see Fig. B22). One is used for B25 engines, the other for B50 engines, and under no circumstances must the positions be confused.

In order to take up backlash in the contact breaker drive the engine must be turned past the mark then rotated forwards to meet it. The piston is now in the correct position for setting the ignition timing.

There is provision in the crankcase for the use of the ignition timing peg (service tool No. 61-1859) comprising a body and plunger. Having lined-up the alternator timing mark, the tool may be used as a means of locking the crankshaft in the correct timing position. Remove the plug at the front of the left crankcase and insert the tool body. Gently push the tool plunger into engagement with the hole that is drilled in the flywheel.

At this stage the auto-advance unit must be freed from its taper, if it is apparent that correct timing will not be achieved by movement of the contact breaker backplate.

Setting the ignition timing statically

It is best to check ignition timing by means of a stroboscope (service tool 00-5177), but in order to do this the engine must be running. Therefore, it is necessary to set the timing statically so that the engine may be started. The simplest method involves the use of a battery and bulb in series with the contact points, as illustrated in Fig. B23.

Connect the contact breaker lead to one terminal of the battery, and make a good earth with the other terminal on the machine via a bulb. It is suggested that the speedometer bulb and lead be used for this purpose.

Slacken the two screws "C", Fig. B20, and centralise the eccentric adjuster "F" so that

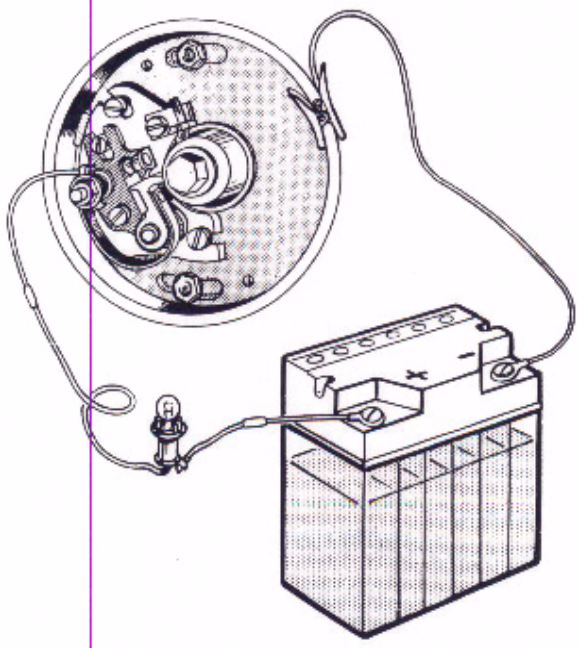


FIG. B23. *Ignition timing light.*

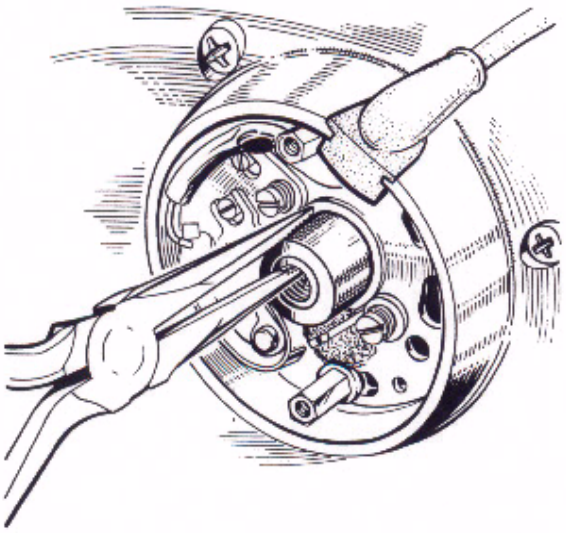


FIG. B24. *Using pliers to set the cam.*

equal adjustment in each direction of rotation of the eccentric is available. Turn the contact breaker base plate as far as possible in a clockwise direction, and fix it lightly with the pillar bolts "E".

Next, using a pair of slim-nosed pliers as shown in Fig. B24, hold the auto-advance unit into its taper, at the same time rotating the unit anti-clockwise until the points are just opening and the light is out. Be very careful not to mark the very accurate finish of the cam with the pliers.

Fix the auto-advance unit with the centre bolt, tightening the bolt to 6 lbs. ft. The timing is now set in the fully retarded position, and it will be necessary to set the timing fully advanced.

Slacken the pillar bolts "E", and turn the contact breaker base plate anti-clockwise to its limit so that the timing light is again lit. Now, push the auto-advance unit cam to the fully advanced position using a screwdriver or similar tool applied in the slot of the cam, and rotate the contact breaker base plate clockwise until the points have just opened and the light is extinguished. The contact breaker base plate is now in its correct position and the pillar bolts "E" may be firmly tightened.

Check the setting by pushing the cam from the retarded to the advanced position—the timing light should be extinguished at the very end of travel of the cam. If necessary, fine adjustment may be made by means of the eccentric "F". Tighten the screws "C".

The engine may now be started and the timing checked by stroboscope.

The importance of accurate ignition timing cannot be over-emphasized. Care and patience must be taken to ensure that the final setting is absolutely correct.

Checking ignition timing with a stroboscope

Most dealers possess electronic equipment specially designed for setting ignition timing very accurately, and it is recommended that owners take advantage of this facility at intervals, or whenever the timing has been disturbed.

If the contact breaker setting has been completely lost or if the engine has been dismantled, a basic static check and preliminary setting as described above must be made in order to facilitate engine starting for the strobe check.

Remove the small inspection cover at the forward end of the primary drive case to expose the generator rotor and ignition pointer.

Connect the strobelight to a suitable battery and attach the high-tension lead to the spark plug. Start the engine and direct the light on to the generator rotor. If the ignition timing is correct, the pointer and the mark on the rotor will line up exactly when the engine exceeds 4,250 r.p.m. (B25) or 3,000 r.p.m. (B50).

Correct any variation by adjusting the contact breaker plate as detailed previously. A minute degree of adjustment may also be obtained by altering the contact points gap. By increasing the gap by ·001" the timing will be advanced by one degree. By closing the gap by ·001" the timing will be retarded by one degree.

REMOVING THE TIMING COVERS

To gain access to the camshaft, oil pump and gearbox components it is necessary to remove the covers on what is known as the timing or gear-side of the engine. The primary drive must have been dismantled as described on page B15, though it is possible to carry out attention to the oil pump, tappets and gear selector mechanism without need of this. However, the complete gear cluster cannot be removed unless the primary drive is first dismantled.

Before attempting to dismantle the inner and outer covers, turn the engine to top dead centre on the compression stroke if the rocker box is fitted—this will avoid straining the inner camshaft bush (due to valve spring pressure) as the inner cover is removed.

To remove the outer cover, take off the gear-change and kickstart pedals, then take out the cover retaining screws, noting their respective locations. The cover, complete with contact breaker plate and clutch operating mechanism, may now be withdrawn, exposing the auto-advance unit and kickstart mechanism.

Take care to avoid losing the clutch operating rack and ball which are loosely located inside the outer cover.

Disengage the kickstart spring from its anchor and kickstart quadrant and unscrew the spring anchor. Leave the kickstart quadrant in place.

Remove the contact breaker auto-advance unit. Take out the remaining fixing screws, noting their locations, and break the crankcase to cover joint by tapping the cover gently with a hide mallet. The cover, with gear cluster assembled, may now be removed, but when withdrawing the cover, hold a finger against the camshaft to avoid disturbing the valve timing unnecessarily.

Note that the camshaft bush in the cover is located by a small peg to ensure correct alignment of the oil holes during reassembly. Check that the oil seals in the covers are not damaged and are fit for further service.

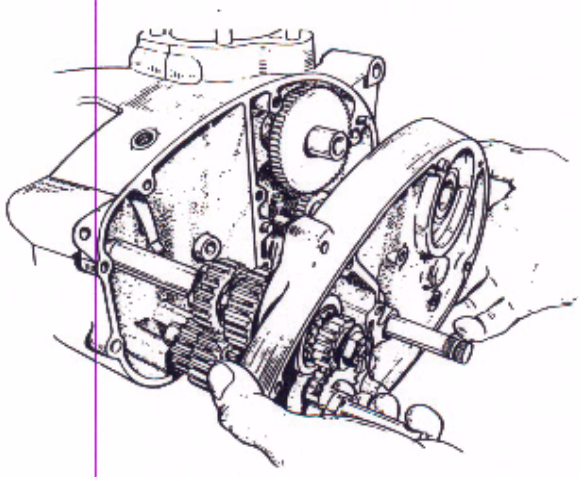


FIG. B25. *Removing inner cover.*

OIL PUMP, TIMING GEARS AND TAPPETS

Oil pump removal

During engine dismantling the oil pump need not be removed unless it is known to require attention.

Use a suitable bar through the connecting rod to prevent rotation of the engine, but use pieces of wood beneath the bar to prevent damage to the crankcase face. Flatten the tab washer under the crankshaft nut and unscrew the nut.

Pull off the crankshaft pinion, using extractor No. 61–3773 with legs 61–3588. The oil pump wormdrive need not be disturbed unless further engine dismantling is to be carried out, in which case the extractor should be used with legs 61–3769.

Unscrew the nuts securing the pump to the crankcase and pull the pump from its mounting studs.

Do not dismantle the pump unless internal damage is suspected.

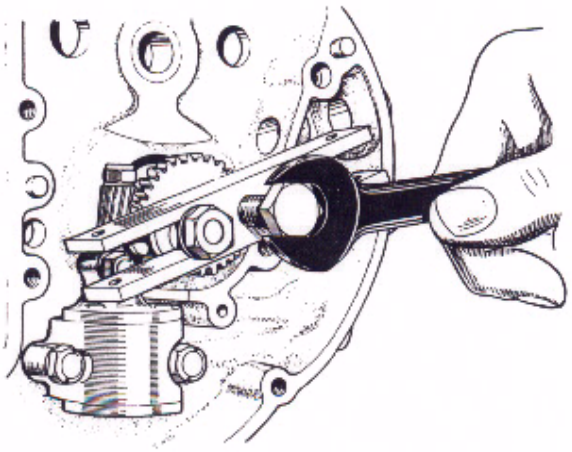


FIG. B26. *Using tool No.* 61–3773.

Dismantling the oil pump

Having removed the oil pump from the engine, take out the four screws from the base of the pump, releasing the base plate and top cover from the pump body.

The driving spindle and driving worm gear are secured to the top cover with a nut and shake-proof washer. Note the position of thrust washers below the feed gears (B50 models only), and that the spindle housing and body are located by means of small dowel pins.

Wash all the parts thoroughly in petrol and allow to dry before examining. Look for foreign matter jammed in the gear teeth and deep score marks in the pump body. These will be evident if regular oil changes have been neglected. Slight marks may be ignored, but any metal embedded in the gear teeth must be removed.

Wear may be found on the gear teeth; if the teeth are worn to the extent that the sharp edges are rounded they must be renewed.

Rebuilding the oil pump

Absolute cleanliness is essential when rebuilding the oil pump.

Insert the driving spindle with fixed gear into its housing, fit the worm drive and secure in position with the nut and spring washer.

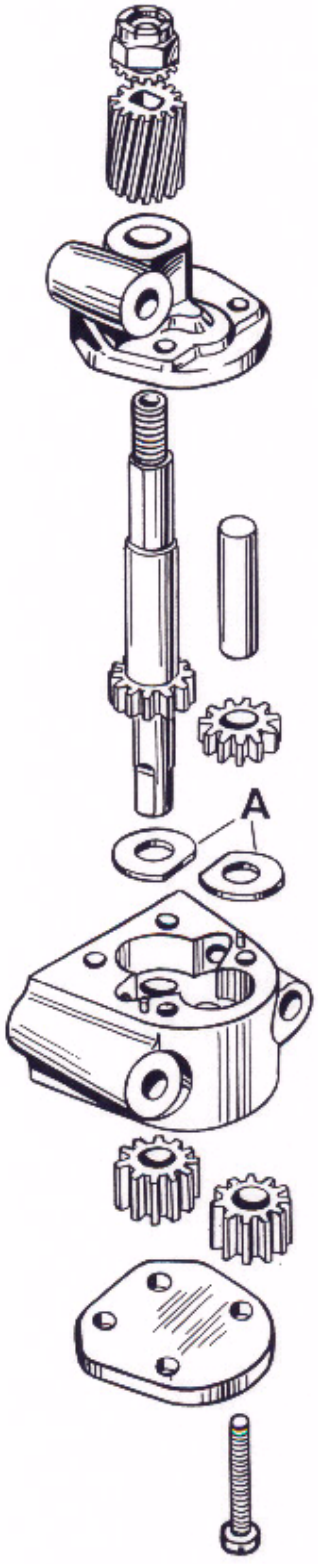


FIG. B27. *Oil pump exploded.*

Fit the thrust washers (B50 only) into the pump body, followed by the driven feed gear with its spindle. Lightly coat one of the joint faces with "Loctite Plastic Gasket" and offer the spindle housing and body up to each other, taking care to locate the dowels and gear teeth correctly. Check that the assembly rotates freely.

Proceed to fit the scavenge gears and bottom plate, again using "Loctite Plastic Gasket" to seal the joint. Tighten the four screws evenly, and again check that the pump is free in operation.

Introduce a few drops of clean oil into the passages in the pump body and rotate the driving spindle to draw oil into the pump, thus lubricating the internal parts.

Finally check that the joint faces are parallel. If the housing face is not level it will be distorted when tightened to the crankcase and may prevent the pump from working freely.

Refitting the oil pump

Ensure that the joint faces are perfectly clean, apply a smear of grease to a new gasket and place the gasket in position on the crankcase face. Locate the pump over the studs, replace the fixing nuts and tighten evenly to a torque of 5—7 lbs. ft. The nuts are self-locking using nylon inserts and it is most important that any replacements are of this type. Any alternative nut **must** be sealed with a drop of "Loctite" to prevent it coming loose in service.

Timing gears

Careful examination of the timing gears will show that there are marks on the faces of the gears, adjacent to the gear teeth.

These marks are to assist in correct reassembly, so ensuring precise valve timing. On early engines, it will be noted that there are two marks on the camshaft gear —a dash and a vee—because the same gear is common to other models. In the case of the B25 and B50, however, **the dash must be ignored** and the marks aligned as in Fig. B28. If the gears are aligned dash to dash

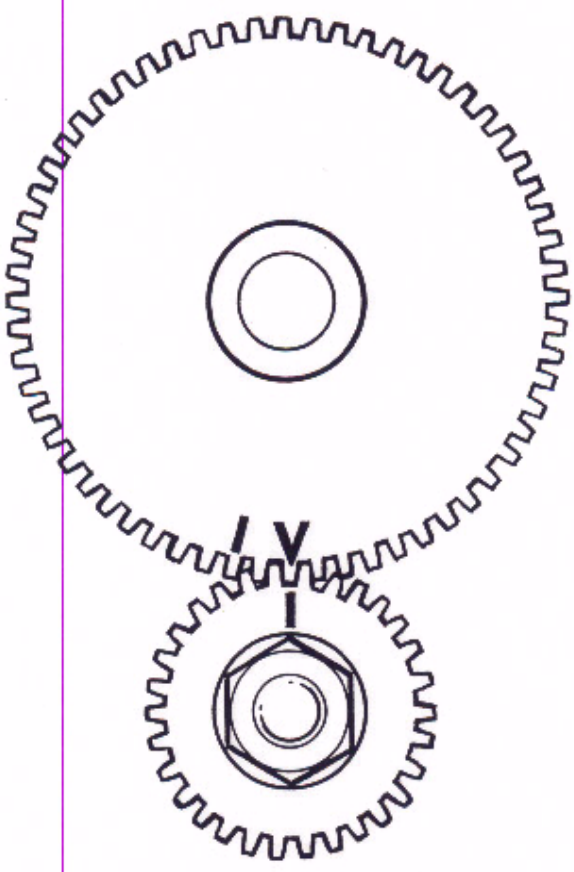


FIG. B28. *Timing marks.*

the valve timing will be advanced by two teeth, causing the inlet valve to foul the piston.

Later engines have only one mark on the camshaft gear—a dash. Align the gears dash to dash.

Pull the camshaft, with pinion, from its location in the crankcase and allow the tappets to fall clear. The pinion is a press-fit on to the keyed end of the camshaft, but must not be disturbed.

Note that on later B25 engines a thrust washer is fitted on the camshaft between the gear and inner cover. Such a washer is not fitted to B50 units.

Removal of the crankshaft pinion and oil pump wormdrive is described in the section dealing with oil pump removal (page B.23).

Tappets

Examine both ends of each tappet for signs of excessive wear or chipping and make sure that they are quite free to move in their locations in the crankcase. If there are signs of "scuffing" on the feet, they should be replaced. The camshaft must also be examined as this may be damaged too.

Note that one end of each tappet foot is slightly **thinner** than the other. When refitting, it is most important that this end faces **forward** as indicated in Fig. B29.

On reassembly of the gears, take care to match the timing marks (see Fig. B28, and text).

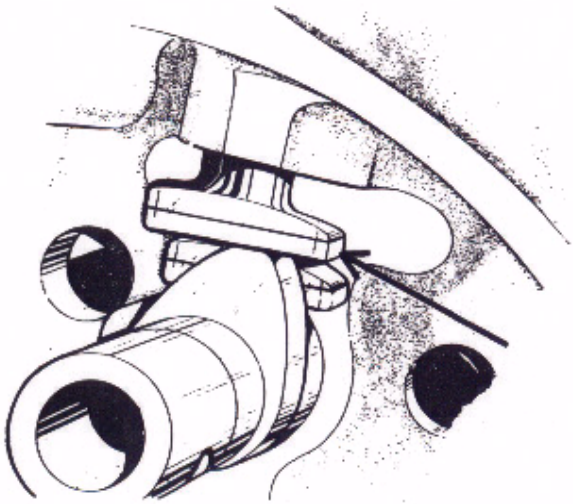


FIG. B29. *Correct fitting of tappets.*

TACHOMETER DRIVE

The tachometer drive is situated in the timing-side crankcase half, just above the pressure release valve. It consists of a spindle with drive gear which is housed in an aluminium body and retained with a small dowel pin. After passing through the body, this pin locates in a groove around the spindle. As a tachometer is not a standard fitting, the crankcase aperture of standard engines is covered by a small plate fixed with two screws.

FIG. B30. *Tachomer drive (exploded).*

Dismantling and reassembly

Due to the position of the tachometer drive aperture in the crankcase, it is necessary to raise the engine unit at the front in order order to remove or refit the drive assembly. Refer to pages B13 and B14.

There should be no need to dismantle the unit except to replace the "O" ring or thrust washer. If it is thought necessary to renew any part, tap the dowel out of the body with a suitable punch. then withdraw the spindle.

Check that the thrust washer has not broken up or that the rubber "O" ring has not perished or split. If even slight evidence of this is noticeable these parts must be replaced. Check also that the drive gear is not worn.

To rebuild the unit slide the thrust washer over the spindle followed by the "O" ring, now smear clean engine oil on to the spindle and slide it into the housing and replace the location dowel.

When refitting the unit into the crankcase do not force the gear into engagement with the oil pump gear drive. If any difficulty is experienced

use a sharp instrument to turn the spindle until it engages, then push the unit home, refit the cable, and replace the screws.

GEARBOX DISMANTLING

Having removed the timing covers with gear cluster assembled as described previously, the gearchange mechanism and gear cluster may be dismantled.

Insert a suitable flat blade between the camplate and gearchange quadrant, thus depressing the plungers, and withdraw the gearchange quadrant complete with spring.

The spring-loaded plungers are retained by a small plate, secured with one screw.

The gearchange return spring pivot bolt need not be disturbed.

Take out the camplate pivot retaining split-pin from the outside of the cover, and, using one of the small inner timing cover screws as an extractor, pull out the pivot with a pair of pliers.

The camplate may now be taken out, together with the selector forks and their spindle, permitting removal of the layshaft complete with gears and the mainshaft sliding gear. Note that although the selector forks are of similar dimensions, the mainshaft fork has a turned witness for identification (see Fig. B31). It is most important that the forks are correctly replaced.

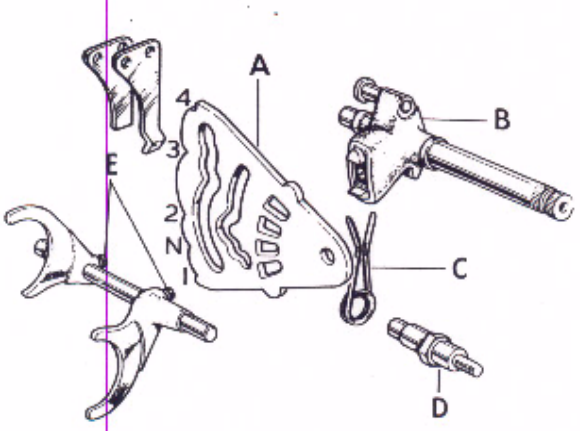


FIG. B32. *Gearchange mechanism.*

A—Camplate *D—Pivot bolt*
B—Plunger quadrant *E—Selector forks*
C—Return spring

The mainshaft fixed gears and the kickstart ratchet assembly remain fixed to the inner cover bearing.

Grip the mainshaft in a soft-jawed vice, and release the ratchet fixing nut. The kickstart mechanism and mainshaft are now separated (Fig. B33),

Kickstart ratchet assembly B50 only

On all B50 models the kickstart ratchet assembly is assembled in reverse of the order

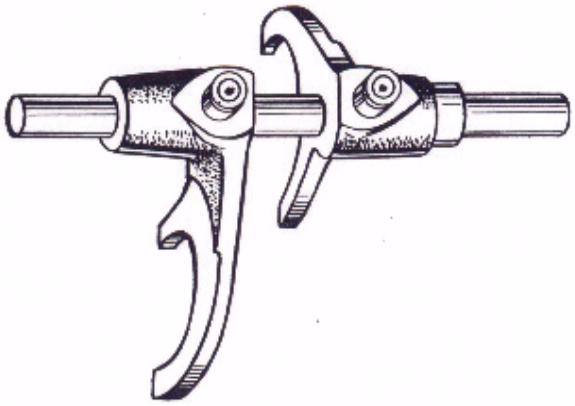


FIG. B31. *Selector forks.*

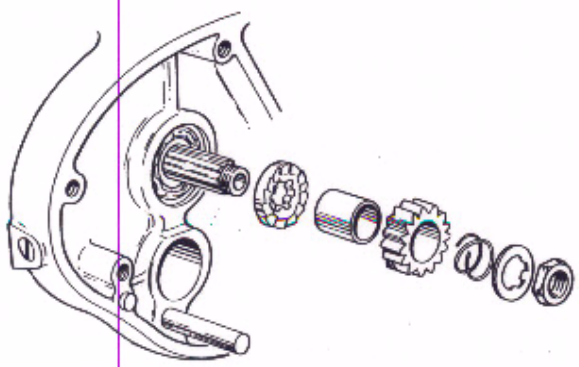


FIG. B33. *Kickstart ratchet.*

shown for B25 in Fig. B33 and there is an additional washer which is fitted against the bearing, followed by the ratchet pinion bush and spring.

To take off the two gears remaining on the shaft it is necessary to support the shaft and gears between the jaws of a vice in order that the shaft, which is an interference fit within the fixed gear, may be driven out using a copper hammer. Make note of the fact that a thrust washer is fitted between the free gear and mainshaft splines.

The layshaft second gear is held by a circlip.

To remove the left gearbox bearing, take off the gearbox sprocket as described on page B17. Using a drift that will pass over the protruding sleeve pinion bush, drive the pinion out of the bearing. Take out the oil seal, and drive the bearing from its housing, having heated the crankcase with the aid of a blow-torch.

Having dismantled the gearbox, make a careful inspection of every component to ensure that it is fit for further service. Look for worn camplate tracks, weak springs, worn bearings and bushes. Examine the gear teeth for pitting on their thrust faces, and replace any part appearing worn or damaged.

GEARBOX REASSEMBLY

With the aid of a blow-torch, heat the crankcase very gently in the area of the bearing housing, being careful to play the flame around so as not to cause distortion, and fit the main gearbox bearing. Refit the oil seal and gearbox sprocket, remembering to bend up the lockwasher. The correct torque for the nut is 100 lbs. ft.

If necessary, fit a new inner cover bearing (having heated the cover in an oven), and assemble the camplate. The camplate must be replaced with the bottom gear notch at the bottom because gearchange positions will otherwise be reversed. Fit the camplate pivot pin, with the threaded end visible to assist future dismantling, and push the split pin through to locate the pin in the inner cover.

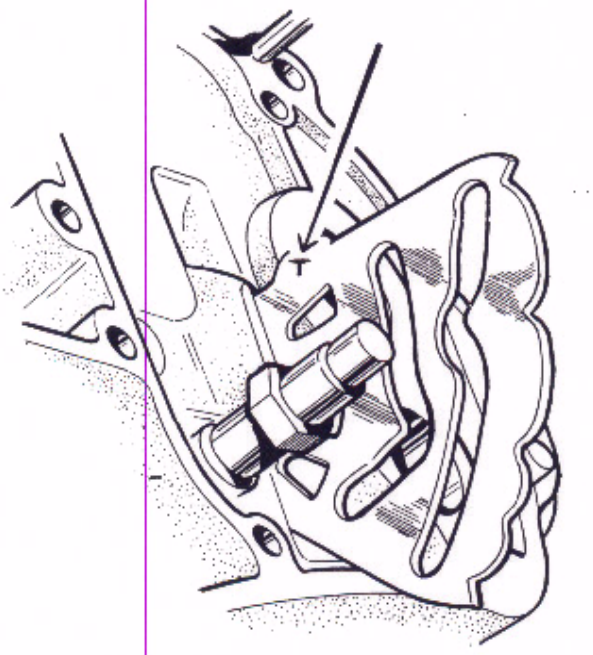


FIG. B34. *Correct fitting of camplate.*

The top side of the camplate is marked "T" for ease of identification—see Fig. B34.

Re-assemble the mainshaft gears, fit the shaft into the inner cover bearing and fit the kickstart ratchet, referring to Fig. B33. Tighten the kickstart ratchet nut to 50–55 lbs. ft. and bend up the lockwasher.

Fit the kickstart quadrant in position, and place the partly assembled inner cover on the edge of the workbench, outside face down, so that the kickstart quadrant is retained but the quadrant shaft and stop are clear of the surface.

Using a little grease to hold it in position, place the layshaft gear shim ("H", Fig. B35) over the bearing in the kickstart quadrant. Engage the layshaft bottom gear ("J") teeth with the corresponding mainshaft gear ("G") making sure that the gear is properly aligned with the layshaft bearing. Take the layshaft sliding gear "K", fit its selector fork (flat face uppermost), and engage the roller of the fork in the lower camplate track.

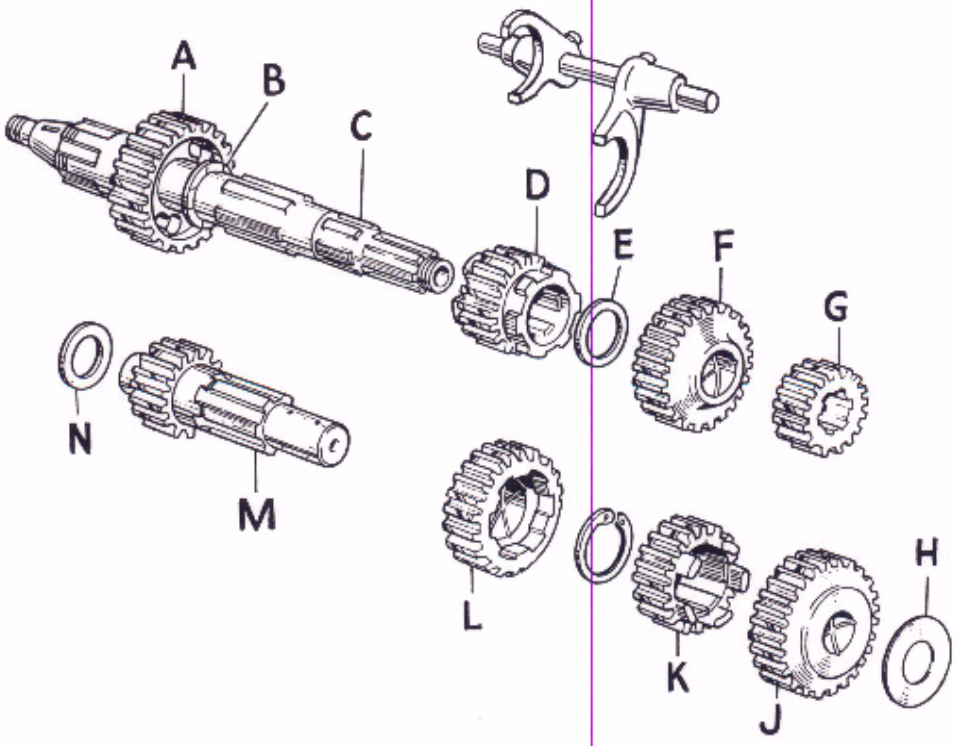


FIG. B35. *Gear cluster exploded.*

A—Mainshaft sleeve pinion (top gear)
B—Mainshaft sleeve pinion thrust washer
C—Mainshaft
D—Mainshaft sliding gear (second gear)
E—Mainshaft third gear thrust washer
F—Mainshaft third gear
G—Mainshaft bottom gear
H—Layshaft bottom gear shim
J—Layshaft bottom gear
K—Layshaft sliding gear (third gear)
L—Layshaft second gear
M—Layshaft
N—Layshaft thrust washer

Assemble the mainshaft sliding gear ("D") with its selector fork (flat face down), and engage the roller of the fork in the upper track of the camplate. Push the selector fork spindle through the forks and into the inner cover, and complete assembly of the gear cluster by fitting the layshaft and layshaft second gear assembly.

Place the mainshaft top gear thrust washer over the mainshaft and retain it with a dab of grease. Fit the layshaft thrust washer, ensuring that the side having a chamfered internal bore faces the gear. If the washer is reversed, the sharp corner may foul the radius of the layshaft, causing the layshaft to lock up through lack of end-float when the gearbox is assembled. Retain the washer with a dab of grease.

Lightly oil all components and rotate the shafts to ensure freedom of movement.

If it has been removed the gearchange return spring must be refitted to the plunger quadrant. The spring is set on manufacture to give accurate positioning of the quadrant plungers in the camplate windows, and usually, it is only possible to achieve the correct relationship of

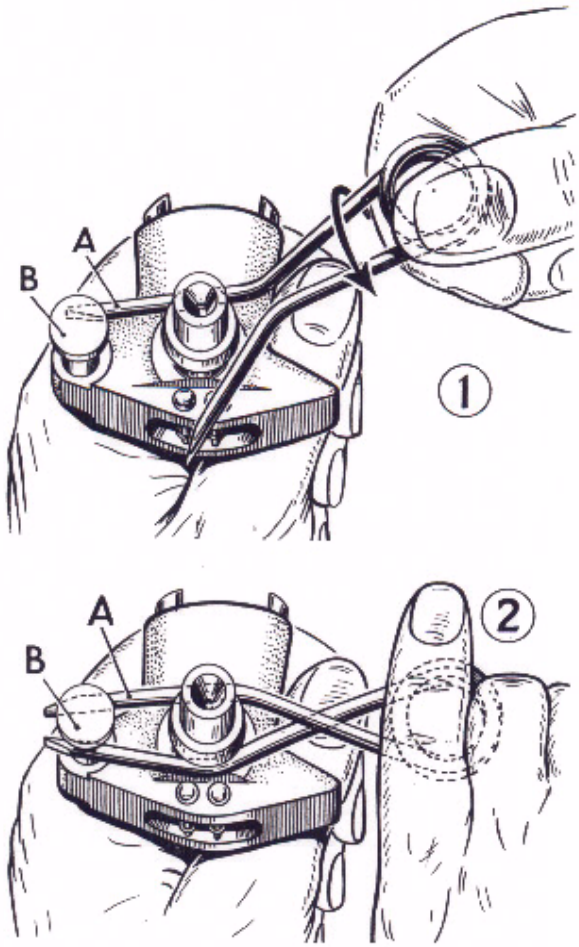


FIG. B36. *Fitting the gearchange return spring.*

parts with the spring fitted one way round. For this reason, the spring is marked with a dab of paint on one side of the coiled end after manufacture, and this side should always face the outside of the gearbox, i.e. towards the body of the plunger quadrant.

If for any reason the spring is not marked, the correct position must be established by trial and error. The spring is correctly fitted when the centres of the two pins on the quadrant and the centre of the coil of the spring are in perfect alignment.

To fit the spring to the quadrant the spring must be twisted into position as illustrated in Fig. B36. Hold the quadrant in the left hand and the coil of the spring, marked side uppermost, between the thumb and forefinger of the right hand. Turn the coil over, at the same time keeping the far point of the spring ("A", Fig. B36) beneath the cap of the quadrant pin ("B").

Fit the quadrant plunger and spring assembly to the inner cover, using a flat blade to depress the plungers whilst the plunger is pushed home.

However, later engines are fitted with an eccentric adjuster, and the position of the plunger quadrant relative to the camplate windows may be adjusted once the gearbox is reassembled into the engine.

The eccentric diameter of the adjuster stop must face the plunger quadrant and any adjustment needed obtained within 90° each way.

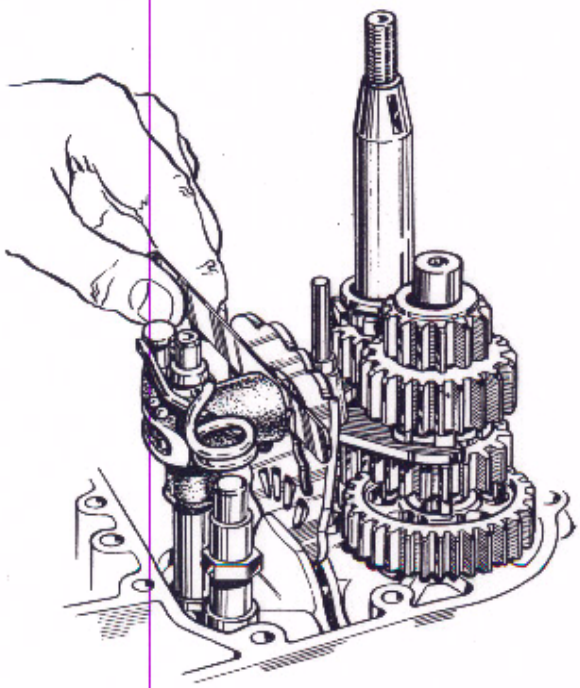


FIG. B37. *Fitting the plunger quadrant.*

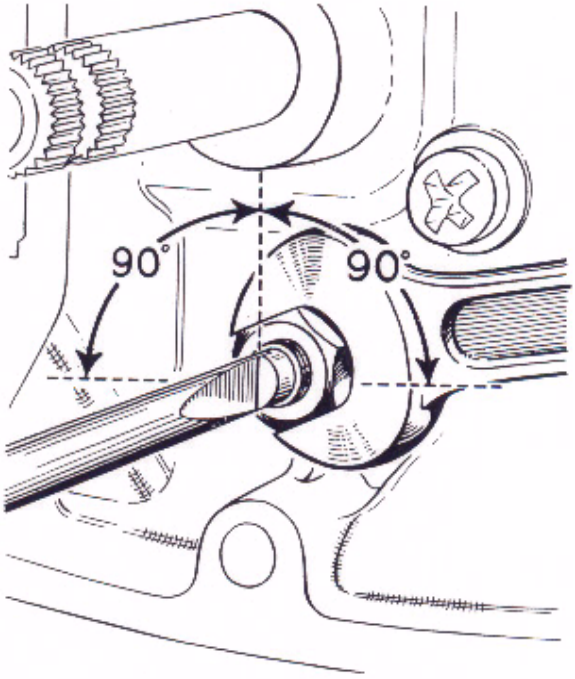


FIG. B38. *Gearchange spring adjustment.*

To adjust the spring, select each gear in turn. If it is not possible to pick up each gear positively, turn the adjuster a little at a time until a suitable condition is arrived at. Lock the adjuster with the nut (see Fig. B38).

If the gearbox has been re-assembled with its original components there will be no need to check the mainshaft and layshaft for end float. However, if new parts such as a crankcase, inner cover or shafts have been fitted, clearances may have altered and alternative thrust washers may be required to take account of this.

Check available and float before the inner cover is tightened to the crankcase permanently by removing the kickstart ratchet mechanism. Layshaft end-float may be established by means of a pair of pliers after removal of the kickstart quadrant. When doing this, be very careful not to damage the bearing surface of the shaft.

See Fig. B35 for the position of each washer, the thicknesses and part numbers of which are as follows:—

(B) ·093"—·094" (40–3020);
·098"—·099" (40–3126);
·103"—·104" (40–3127)'

(E) ·070"—·071" (40–3119);
·075"—·076" (40–3019);
·080"—·081" (40–3120).

(H) Standard shim (40–3258).

(N) ·078"—·080" (41–3072);
·083"—·085" (41–3074).

When all components have been assembled on the inner cover, clean both joint faces with petrol and apply an unbroken film of "Loctite Plastic Gasket" to one face only.

Lubricate the crankshaft oil seal and camshaft spindle, and slide the cover with gears assembled into the crankcase.

Proceed by fitting all screws to the cover, and tighten them evenly to the correct torque (3·5—4·5 lbs. ft.). Before fitting the outer cover check for correct operation of gears.

Refit the outer cover, again after applying "Loctite Plastic Gasket" to one joint face. Set the ignition timing as described on page B20.

SEQUENCE OF GEARCHANGING

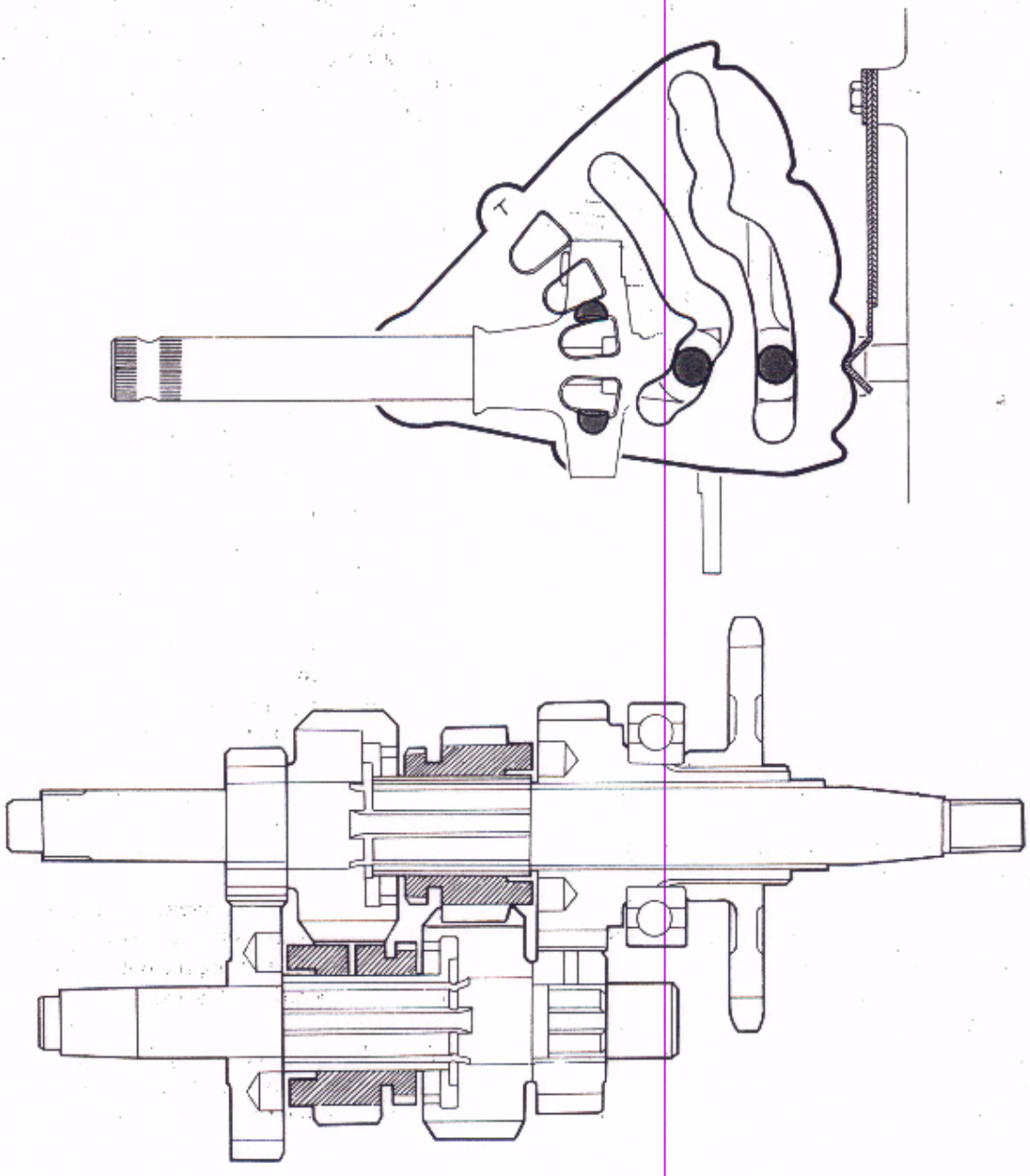


FIG. B39. *Neutral gear position.*

The gears must always be in the neutral position for kickstarting the engine. This is the position shown in Fig. B39.

The spring plate is holding the cam plate by the second notch. At the other end of the camplate the selector quadrant plungers are compressed ready to operate either way the pedal is moved.