TRIUMPH

WORKSHOP MANUAL FOR 250 c.c. (15 CU. IN.) SINGLE CYLINDER

WORKSHOP MANUAL

FOR

250c.c. (15cu.in.) SINGLE CYLINDER

TRIUMPH ENGINEERING CO. LTD.

MERIDEN WORKS · ALLESLEY · COVENTRY CV5 9AU · ENGLAND

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IMPORTANT NOTE

Any modifications to any Triumph motorcycle made by you or to be made by you in the future shall be held by our company to have been modified at your own risk and responsibility and without either the explicit or implied consent of Triumph Engineering Co. Ltd. or Triumph Motorcycle Corporation. We will assume no liability, obligation or responsibility for any defective or modified parts or for the modified motorcycle itself, or for any claims, demands or legal action for property damage or personal injuries which may result from the modification of any Triumph motorcycle.

INTRODUCTION

THIS manual has been compiled and prepared to provide the necessary service information for workshop, fitter, technical staff and individual owner, wishing to carry out basic maintenance and repair work on the TRIUMPH 250 c.c. MODEL T25T and T25SS.

GENERAL DATA for all models within the above range is provided in ready reference form, and a separate section covering Service Tools is fully illustrated at the end of this manual.

The manual is divided into sections dealing with major assemblies, throughout the machine, each section subdivided into sequence order corresponding to normal operations of strip down, examination and rebuilding procedure.

ENGINE AND FRAME NUMBERS

Note: The engine number is located on the left side of the engine, immediately below the cylinder barrel flange. The number is stamped onto a raised pad.

The first letter indicates the month of manufacture as follows:—

A	January
B	February
C	March
D	April
E	May
G	June
H	July
J	August
K	September
N	October
P	November
X	December

The third Section is a numerical block of five figures which commence with engine number 00100.
The fourth Section indicates the model.

Example	*Month*	*Year*	*Number*	*Model*
	N	C	00100	T25T

On later models the system of numbering is changed, and a prefix is added indicating the month and year of manufacture.

The second letter indicates the season year of manufacture as follows:—

C	1969
D	1970
E	1971
G	1972
H	1973
J	1974
K	1975
N	1976
P	1977
X	1978
A	1979
B	1980

The frame number is stamped on the left side of the frame, on the front engine mounting lug. Both the engine and frame numbers should coincide.

GUARANTEE

Please refer to your local dealer or distributor where required for the latest terms of guarantee.

EASTERN U.S.A. DISTRIBUTORS

TRIUMPH MOTORCYCLE CORPORATION,
P.O. BOX 6790, TOWSON, BALTIMORE 4,
MARYLAND 21204.
Cables: Triumph Baltimore.
Telex: 87728

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FACTORY SERVICE ARRANGEMENTS

UNITED KINGDOM ONLY

CORRESPONDENCE

Technical Advice, Guarantee Claims and Repairs

Communications dealing withany of these subjects should be addressed to the **SERVICE DEPARTMENT.**

In all communications the full engine number complete with all prefix letters and figures should be stated. This number will be found on the L.H. side of the crankcase just below the cylinder flange.

TECHNICAL ADVICE

It will be appreciated how very difficult it is to diagnose trouble by correspondence and this is made impossible in many cases because the information sent to us is so scanty. Every possible point which may have some bearing on the matter should be stated so that we can send a useful and detailed reply.

REPLACEMENT PARTS

Replacement parts are no longer supplied direct from the factory to the individual owner. They should be obtained from the nearest local Triumph dealer.

There is a nation-wide network of stockists, a list of which is available from the factory on request.

REPAIRS

Before a motorcycle is sent to our Works an appointment must be made. This can be done by letter or telephone. When an owner wishes to return his machine for guarantee repairs, he should first consult his Dealer as we do not normally accept machines in our Repair Shop direct from private owners. Frequently the Dealer can overcome the trouble without the delay and expense of sending the machine to the Works. This avoids the machine being out of use for some days when it could be on the road. Where parts such as cylinders, petrol tanks, etc., are forwarded for repair, they should be packed securely so as to avoid damage in transit. The dealer's name and address should be enclosed together with full instructions. In the case of complete motorcycles, a label showing the dealer's name and address should always be attached and all accessories such as tools, inflator, handlebar mirrors and other parts removed.

SERVICE EXCHANGE RECONDITIONED UNITS

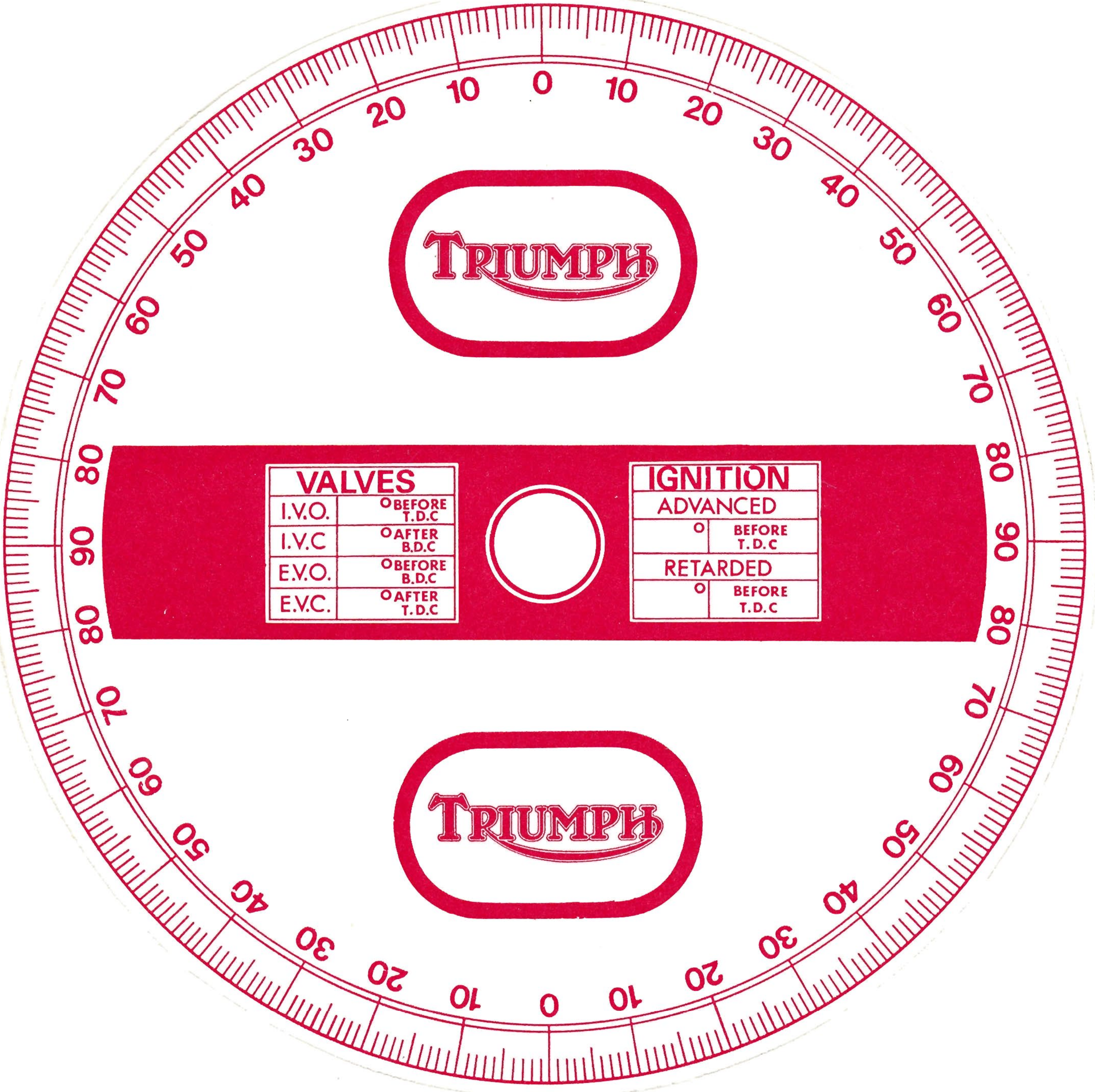
A range of service exchange reconditioned units is available from the Factory Service Department. This list includes petrol tanks, front forks, front and rear frames, clutch plates, brake shoes, etc., which are supplied after the return of the original equipment for inspection and acceptance. Operation of this scheme is maintained solely through the Dealer network.

CONTENTS

TRIUMPH 250 c.c. BLAZER SS T25SS (U.S.A. only)

TRAILBLAZER T25T (U.S.A. only)

BLAZER SS T25SS (Home and General Export)



ENGINE TIMING DISC. PUSH OUT AND USE FOR VALVE TIMING IGNITION SETTING ETC.

GENERAL DATA

BLAZER SS T25SS (USA)
TRAIL BLAZER T25T
BLAZER SS T25SS (Home and General Export)
250cc. (15 cu. ins.)

MODEL T25SS—BLAZER SS (USA ONLY)

ENGINE

PISTON

Material	HG413 Aluminium alloy
Compression ratio	9·5 : 1
Clearance (bottom of skirt)	·0023/·0028 in. (·05842/·07112 mm.)
Clearance (top of skirt)	·0042/·0053 in. (·10668/·13462 mm.)
(Both measured on major axis)	

PISTON RINGS

Material—compression (top)	H.G.22 cast iron
Material—compression (centre)	H.G.22 cast iron
Material—scraper	H.G.22 cast iron
Radial width—compression (top and centre)	0·1015/0·1074 in. (2·577/2·729 mm.)
Radial width—scraper	0·1015/0·1074 in. (2·577/2·729 mm.)
Depth—compression (top and centre)	0·0615/0·0625 in. (1·5627/1·588 mm.)
Depth—scraper	0·124/0·125 in. (3·149/3·175 mm.)
Clearance in groove	·001/·003 in. (·0254/·0762 mm.)
Fitted gap—(maximum)	·013 in. (·3302 mm.)
Fitted gap—(minimum)	·009 in. (·2283 mm.)
Connecting rod (length between centres)	5·312 in. (134·92 mm.)
Internal dia. of small end	·6892 in. (17·51 mm.)

OIL PUMP

Pump body material	Zinc base alloy
Type	Double gear
Drive ratio	1 : 4
Non-return valve spring (free length)	·625 in. (15·875 mm.)
Non-return valve spring ball (diameter)	·25 in. (6·35 mm.)
Oil pressure release valve spring (free length)	·6094 in. (15·4781 mm.)
Oil pressure release valve ball (diameter)	·3125 in. (7·9375 mm.)

CAMSHAFT

Journal diameter (right and left-hand)	·7480/·7485 in. (18·9992/19·0119 mm.)
Cam lift (inlet)	·345 in. (8·763 mm.)
Cam lift (exhaust)	·336 in. (8·534 mm.)
Base circle radius	·906 in. (23·0124 mm.)

CAMSHAFT BEARING BUSHES

Bore diameter (fitted)	·7492/·7497 in. (19·0297/19·04238 mm.)
Outside diameter	·908/·909 in. (23·0632/23·0886 mm.)
Camshaft clearance	·0007/·0017 in. (·01778/·04318 mm.)

CRANKSHAFT

End float	·002/·005 in. (·0508/·127 mm.)

VALVES

Seat angle (inclusive)	90°
Head diameter (inlet)	1·450/1·455 in. (36·830/36·957 mm.)
Head diameter (exhaust)	1·312/1·317 in. (33·3248/33·4518 mm.)
Stem diameter (inlet)	·3095/·3100 in. (7·861/7·874 mm.)
Stem diameter (exhaust)	·3090/·3095 in. (7·848/7·861 mm.)

VALVE GUIDES

Material	Hidural 5
Bore diameter	·3120/·3130 in. (7·9248/7·950 mm.)
Outside diameter	·5005/·5010 in. (12·7127/12·7254 mm.)
Length	1·844 in. (46·8276 mm.)
Cylinder head interference fit	·0015/·0025 in. (·0381-3·0635 mm.)

VALVE SPRINGS

Free length (inner)	1·400 in. (35·56 mm.)
Free length (outer)	1·750 in. (44·45 mm.)
Fitted length (inner)	1·262 in. (32·0548 mm.)
Fitted length (outer)	1·370 in. (34·798 mm.)

VALVE TIMING

Tappets set to ·015 in. (·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°

TAPPET CLEARANCE Cold

Inlet	·008 in. (·2032 mm.)
Exhaust	·010 in. (·254 mm.)

IGNITION TIMING

Piston position (B.T.D.C.) fully advanced	·342 in. (8·6868 mm.)
Crankshaft position (B.T.D.C.) fully advanced	37°
Contact breaker gap setting	·015 in. (·381 mm.)

SPARK PLUG

Type	Champion N3
Gap setting (minimum/maximum)	·020/·025 in. (·508/·635 mm.)
Thread size	14 mm. dia. × ·75 in. reach (19·05 mm.)

CYLINDER BARREL

Material	Aluminium alloy with austenitic iron liner
Bore size (standard)	67 mm.
Stroke	70 mm.
Oversizes	0·010 and 0·020 in. (0·254 and 0·508 mm.)

CYLINDER HEAD

Material	Aluminium alloy
Inlet port size	1·125 in. (28·575 mm.)
Exhaust port size	1·25 in. (31·75 mm.)

CARBURETTER

Type	Amal 928/20 (concentric float chamber)
Main jet	190
Needle jet size	·106 in. (2·69 mm.)
Needle position	1
Throttle valve	3½
Nominal choke size	28 mm.
Throttle slide return spring (free length)	2·5 in. (63·5 mm.)

BEARING DIMENSIONS

Clutch roller (25)	·1875 × ·1875 in. (4·7025 × 4·7025 mm.)
Con-rod big-end bearing—running clearance	·0005/·0010 in. (·0127/·0254 mm.)
Con-rod big-end—crank diameter	1·4375/1·4380 in. (36·5125/36·5252 mm.)
Crank undersizes	·010, ·020 and ·030 in. (·254, ·508 and ·762 mm.)
Con-rod small-end bush (bore)	·6890/·6894 in. (17·5006/17·6108 mm.)
Crankcase bearing (drive-side)	25 × 62 × 17 mm.
Crankcase bearing (timing-side)	25 × 62 × 17 mm.
Crankshaft diameter (drive-side and timing-side)	·9841/·9844 in. (24·9961/22·0038 mm.)
Gearbox layshaft bearings (drive-side and timing-side)	0·5 × ·625 × ·8125 in. (12·7 × 15·875 × 20·6375 mm.)
Gearbox layshaft diameter (drive-side and timing-side)	·6245/·625 in. (15·8623/15·8750 mm.)
Gearbox mainshaft bearing (drive-side)	30 × 62 × 16 mm.
Gearbox mainshaft bearing (timing-side)	·625 × 1·5625 × ·4375 in. (15·875 × 39·2875 × 11·1125 mm.)
Gearbox mainshaft diameter (drive-side)	·7485/·749 in. (19·0119/19·0246 mm.)
Gearbox mainshaft diameter (timing-side)	·6245/·625 in. (15·8623/15·8750 mm.)
Gearbox sleeve pinion (internal diameter)	·752/·753 in. (19·1008/19·1262 mm.)
Gearbox sleeve pinion (external diameter)	1·179/1·180 in. (29·9466/29·9720 mm.)
Gudgeon pin diameter	·6882/·6885 in. (17·4803/17·4879 mm.)

TRANSMISSION

CLUTCH

Type	Multi-plate with integral cush drive
Number of plates:	
Driving (bonded segments)	4
Driven (plain)	5
Overall thickness of driving plate and segments	·167 in. (4·242 mm.)
Clutch springs	4
Free length of springs	1·65685 in. (42·0687 mm.)
Clutch push rod (length)	9·0 in. (228·6 mm.)
Clutch push rod (diameter)	·1875 in. (4·7025 mm.)

GEAR RATIOS

Gearbox—top	1·0
—third	1·24
—second	1·65
—first	2·65
Overall—top	6·89
—third	8·54
—second	11·37
—first	18·26

SPROCKETS

Engine	23 teeth
Clutch	52 teeth
Gearbox	17 teeth
Rear wheel	52 teeth

CHAIN SIZES

Primary	Duplex ·375 in. × 70 links
Transmission	0·625 in. × 108 links

FRAME AND FITTINGS

FRONT FORKS

Type	Coil-spring (hydraulically damped)
Springs—free length	19·1 in. (48·5 mm.)
—Compressed length	11·4 in. (289·5 mm.)
—fitted length	18·5 in. (217 mm.)
—Spring rate	25 lb/in.
—Max. lead	194 lbs. (45·5 kg.)
—colour identification	Orange
Stanchion diameter top	1·355/1·350 in.(34·4/34·3 mm.)
Stanchion diameter bottom	1·3610/1·3605 (34·6/34·55 mm.)
Stanchion internal bore	1·095/1·089 in. (27·8/27·66 mm.)
Outer member bore size	1·365/1·363 in. (27·05/27 mm.)

REAR DAMPERS

Type	Coil-spring (hydraulically damped)
Springs—free length	8·40 in. (213·36 mm.)
—spring rate	100 lb./in.
—colour identification	Green/pink (applies both to chrome or black springs)

SWINGING ARM

Bearing type	Torrington needle roller bearings B1616 2 off
Spindle diameter	·801/·800 in. (20·35/20·32 mm.)
Bearing sleeve diameter	1·0000/·9995 in. (25·4/25·388 mm.)
Thrust washer depth	·199/·197 in. (5·05/4·99 mm.)

WHEELS, BRAKES AND TYRES

WHEELS

Rim size and type (front)	WM2–18
Rim size and type (rear)	WM2–18
Spoke sizes:	
Front (10)	10 s.w.g. × 6·3 in. (165 mm.)
Front (10)	10 s.w.g × 6·4 in. (167·6 mm.)
Front (20)	10 s.w.g. × 7·7 in. (195·6 mm.)
Rear (10)	10 s.w.g. × 5·7 in. (144·8 mm.)
Rear (10)	10 s.w.g. × 4.5 in. (114 mm.)
Rear (20)	10 s.w.g. × 6·9 in. (175 mm.)

WHEEL BEARINGS

Front (left and right hand)	20 × 47 × 14 mm. Ball journal
Rear (left and right-hand)	20 × 47 × 14 mm. Ball journal
Rear brake drum	20 × 47 × 14 mm. Ball journal
Spindle diameter (front)	·8740/·8745 in. (22·199/22·212 mm.)
Spindle diameter (rear, left-hand)	·8745/·8750 in. (22·212/22·225 mm.)
Spindle diameter (rear, right-hand)	·685/·686 in. (17·399/17·424 mm.)

BRAKES

Front (diameter) single leading shoe	6 in. (152 mm.)
Front (width) single leading shoe	·875 in. (22·2 mm.)
Rear (diameter)	7 in. (177·8 mm.)
Rear (width)	1·125 in. (28·5 mm.)
Lining thickness front	9·8 in.^{2} (63·3 cm^2)
Lining thickness rear	17·4 in.^{2} (112·4 cm^2)

TYRES

Size (front)	3·25 × 18 in. (82·55 × 457·2 mm.)
Size (rear)	3·50 × 18 in. (88·9 × 457·2 mm.)
Pressure (front)	22 p.s.i. (1·547 kg./sq. cm.)
Pressure (rear)	24 p.s.i. (1·685 kg./sq.cm.)
Speedometer drive ratio	2 : 1

12 VOLT ELECTRICAL EQUIPMENT

Battery	Lucas PUZ5A
Coil	Lucas MA.12
Contact breaker unit	Lucas 6CA
Generator	Lucas RM.21
Generator output	115 watt
Horn	Lucas 6H
Rectifier	Lucas 2DS.506
Zener Diode	Lucas ZD.715
Bulbs—headlamp (main)	40/50 watt Lucas 380
—headlamp (pilot)	6 watt Lucas 989
—warning lamps	2 watt
—stop-tail lamp	6/21 watt
Condenser	Lucas 54441582
Capacitor	Lucas 2MC
Flasher Unit	Lucas 8FL
Headlamp	Lucas MCH66
Handlebar switch (right)	Lucas 1695A
Handlebar switch (left)	Lucas 1695A
Ignition switch	Lucas 14695A
Rear stop switch	Lucas 1185A

CAPACITIES

Fuel tank	2½ U.S. galls (14·774 litres)
Oil reservoir	4 pints/4·8 U.S. (2·273 litres)
Gearbox	0·5 pint/0·6 U.S. (·284 litre)
Primary chaincase	0·25 pint/0·3 U.S. (·142 litre)
Front fork (each leg)	0·34 pint/0·4 U.S. (·1893 litre)

BASIC DIMENSIONS

Wheelbase	54 in. (137 cm.)
Overall length	85 in. (216 cm.)
Handlebar width	29 in. (73·5 cm.)
Seat height	32 in. (81·28 cm.)
Ground clearance	7 in. (18 cm.)
Overall height	43·5 in. (110·5 mm.)

WEIGHTS

Machine unladen	280 lbs. (131 kg.)
Engine/gearbox unit (less carburetter)	85 lbs. (39 kg.)

TORQUE SETTINGS

Application	Torque
Carburetter Flange nuts	10 lb. ft. (1·38 kg. m.)
Clutch centre nut	60 lb. ft. (8·3 kg. m.)
Conn-rod end cap nuts	27 lb. ft. (3·7 kg. m.)
Crankshaft pinion nut	40 lb. ft. (5·5 kg. m.)
Cylinder barrel nuts	20 lb. ft. (2·8 kg. m.)
Fork leg cap nuts	40 lb. ft. (5·5 kg. m.)
Fork leg pinch bolts	18/20 lb. ft. (2·5/2·8 kg.m.)
Kickstart ratchet nut	50 lb. ft. (6·9 kg. m.)
Oil pump stud nuts	6 lb. ft. (0·8 kg. m.)
Rotor fixing nut	60 lb. ft. (8·3 kg. m.)
Valve cover nuts	10 lb. ft. (1·4 kg. m.)
Spark plug	14 lb. ft. (1·9 kg. m.)
Flywheel bolts	32 lb. ft. (4·4 kg. m.)
Stator nut	20 lb. ft. (2·8 kg. m.)
Counter shaft sprocket nut	75 lb. ft. (10·4 kg. m.)
Fork stanchion end plug	25 lb. ft. (3·45 kg. m.)
Handlebar clamp bolts	12 lb. ft. (1·6 kg. m.)

GENERAL DATA

T25SS HOME AND GENERAL EXPORT
For data not supplied here refer to General Data for T25SS U.S.A.

WHEELS, BRAKES AND TYRES

WHEELS	
Spoke sizes:	
Front (20)	10 s.w.g. × 6·9 in. (175·26 mm.)
Front (10)	10 s.w.g. × 4·9 in. (124·46 mm.)
Front (10)	10 s.w.g. × 4·6 in. (116·8 mm.)
BRAKES	
Front (diameter) twin leading shoe	8 in. (203 mm.)
CAPACITIES	
Fuel tank	2 galls. (9 liters)

T25T U.S.A. ONLY
For data not supplied here refer to General Data for T25SS U.S.A.

WHEELS AND TYRES

WHEELS	
Spoke sizes:	
Front (10)	10 s.w.g. × 7·2 in. (183 mm.)
Front (10)	10 s.w.g. × 7·8 in. (198 mm.)
Front (20)	10 s.w.g. × 8·6 in. (218·5 mm.)
RIM SIZE	
Front	WM1 × 20
Rear	WM3 × 18
Tyre size:	
Front	3 × 20 Trials universal
Rear	4 × 18 Trials universal
Rear Chain No. of links	107
Gearbox Sprocket	16T
Speedometer Drive ratio	21 : 10
OVERHAUL GEAR RATIOS	
Top	7·35
3rd	9·10
2nd	12·13
1st	19·49
Weight (unladen)	287 lbs (130·2 kg.)
DIMENSIONS	
Ground clearance	7ins. (195·5 mm.)

GEAR RATIO CALCULATIONS

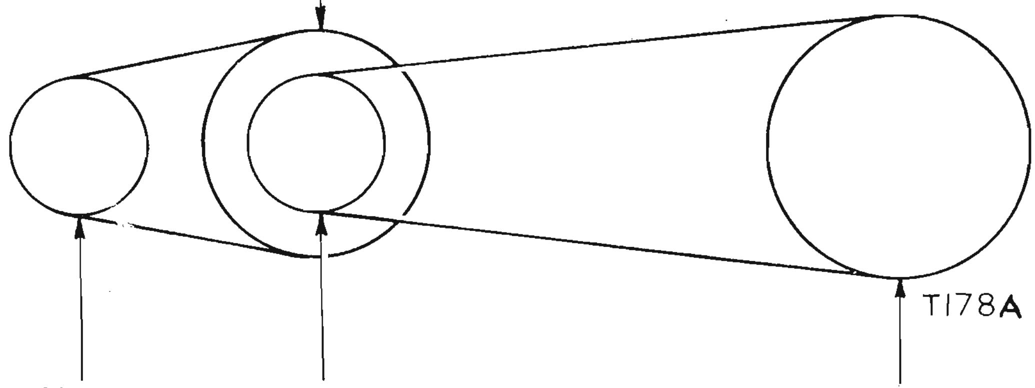


Fig. G.D.1. Arrangement of sprockets.

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

Divide the number of teeth on the primary chainwheel by the number of teeth on the engine sprocket and multiply the result by the number of teeth on the rear wheel sprocket, divided by the number of teeth on the gearbox sprocket, as example:—

$$\frac{\textit{clutch sprocket } (52)}{\textit{engine sprocket } (23)} \times \frac{\textit{rear wheel sprocket } (52)}{\textit{gearbox sprocket } (17)} = \frac{2704}{391} = 6{\cdot}92$$

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

top gear 6·92 × *bottom gear internal ratio* 2·65=18·15 *bottom gear overall ratio*

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

as example:—

$$\frac{(\textit{layshaft 3rd})\ 19T}{(\textit{mainshaft 3rd})\ 24T} \times \frac{(\textit{mainshaft top})\ 22T}{(\textit{layshaft top})\ 14T} = 1{\cdot}245$$

SECTION A

LUBRICATION SYSTEM

INDEX

SECTION A1

ROUTINE LUBRICATION

Ref. No.	
	Weekly
1	Check oil reservoir level
7	Grease brake pedal pivot
8	Oil exposed cables and control rod joints
	Every 500 Miles (800 Km.)
3	Check oil level in primary chaincase
	Every 2,000 Miles (3,200 Km.)
1	Drain and refill the oil reservoir
2	Check oil level in gearbox
10	Clean the oil filters
11	Lubricate prop stand (oil)
6	Grease brake cam spindle(s)

Ref. No.	
6	Grease rear brake cam spindle
12	Lubricate rear chain
	Every 3,000 Miles (4,800 Km.)
13	Lubricate auto advance
14	Lubricate contact breaker cam
16	Renew disposable oil filter
	Every 5,000 Miles (8,000 Km.)
15	Grease speedometer drive cable
2	Drain and refill gearbox
3	Drain and refill primary chaincase
9	Drain and refill front forks
	Every 10,000 Miles (16,000 Km.)
4	Grease wheel bearings
5	Grease steering head bearings

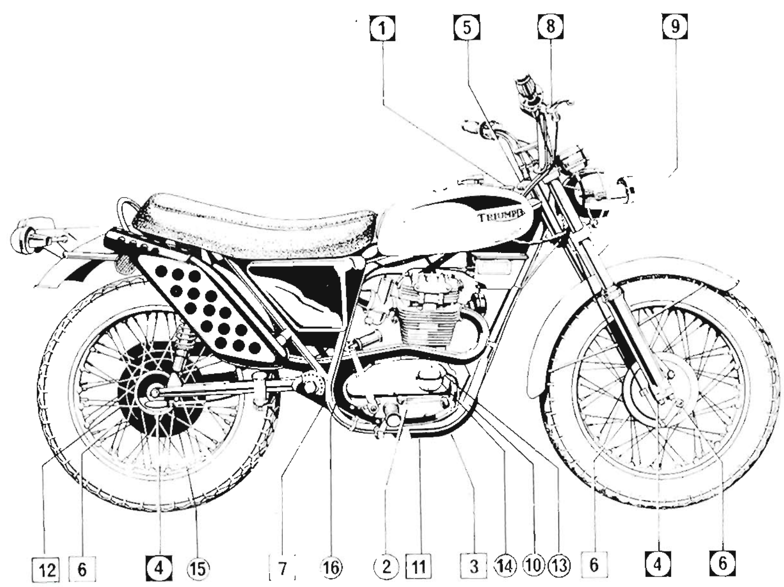


Fig. A1. Lubrication points.

(Numbers in circles refer to right side of machine; numbers in squares refer to left side of machine)

SECTION A2

RECOMMENDED LUBRICANTS (All Markets)

UNIT	MOBIL	CASTROL	B.P.	ESSO	SHELL	TEXACO
Engine	Mobiloil Super	Castrol GTX or Castrol XL	B.P. Super Visco-Static	Uniflo	Shell Super Motor Oil	Havoline Motor Oil 20W/50
Primary Chaincase	Mobiloil Super	Castrolite	B.P. Super Visco-Static	Uniflo	Shell Super Motor Oil	Havoline Motor Oil 10W/30
Gearbox	Mobilube GX 90	Castrol Hypoy	B.P. Gear Oil SAE 90 EP	Esso Gear Oil GX 90/140	Shell Spirax 90 EP	Multigear Lubricant EP 90
Telescopic Fork ...	Mobil ATF 210	Castrol TQF.	B.P. Autron "B"	Esso Glide	Shell Donax T.7.	Texomatic "F"
Wheel Bearings, Swinging Fork and Steering Races	Mobilgrease MP or Mobilgrease Super	Castrol LM Grease	B.P. Energrease L2	Esso Multipurpose Grease H	Shell Retinax A	Marfak All Purpose
Easing Rusted Parts	Mobil Handy Oil	Castrol Penetrating Oil		Esso Penetrating Oil	Shell Easing Oil	Graphited Penetrating Oil

APPROVED LUBRICANTS (All Markets)

	Engine	**Primary Chaincase**	**Gearbox**	**Telescopic Fork**	**Wheel Bearings, Swinging Fork and Steering Races**	**Easing Rusted Parts**
DUCKHAM'S	Duckham's Q20/50	Duckham's Q5500 or Q-Matic	Duckham's Hypoid 90	Duckham's Q-Matic	Duckham's LB10 Grease	Duckham's Adpenol Penetrating Oil
FILTRATE	Filtrate Super 20W/50	Filtrate Super 10W/30	Filtrate EP.90	Filtrate AT. Fluid "F"	Filtrate Super Lithium Grease	

SECTION A3

ENGINE LUBRICATION SYSTEM

The engine lubrication system is of the dry sump type, i.e., the oil is fed by gravity from a reservoir to a double-gear pump situated in the crankcase base at the right-hand side (see Fig. A2).

The top set of gears in the pump draws oil from the reservoir through a gauze filter and circulates it under pressure, past a pressure release valve (D) a non-return valve (A) and through the drilled crankshaft to the big-end bearing. Excess oil is thrown off by centrifugal force, on to the cylinder walls and the underside of the piston (to lubricate the gudgeon pin) and fills various wells to lubricate the camshaft and gears. An oil pressure indicator switch is incorporated into the feed system (B).

After lubricating the various internal components of the engine, the oil drains down into the crankcase.

From here the lower, and larger set of pump gears draws oil from the gauze sump filter through another non-return valve (C) and pumps it back to the reservoir at a greater rate than that of the feed side. This ensures that the sump never floods; hence the term "dry sump".

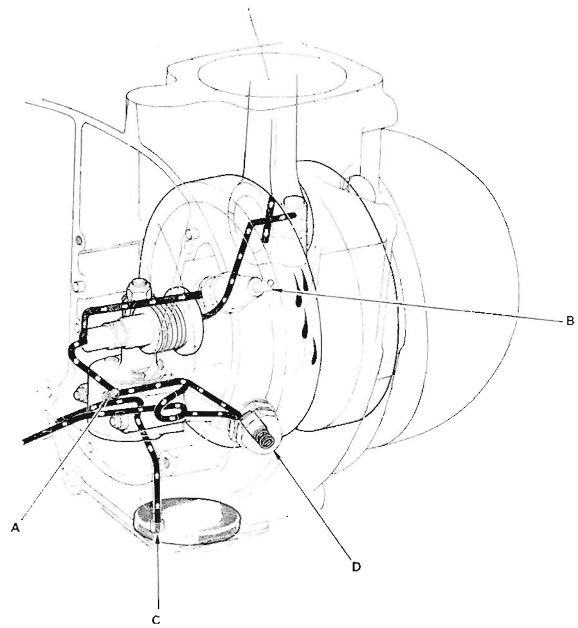


Fig. A2. Engine lubrication system showing ball valves

The oil return pipe is tapped at the crankcase union to provide a supply of oil at low pressure to the valve rocker gear.

The oil is fed through the rocker shafts, lubricating the rocker ball pins, adjuster screws and finally the tappets as it drains back into the crankcase.

SECTION A4

CHANGING THE OIL AND CLEANING THE FILTERS

The oil in new or reconditioned engines should be changed at 250, 500 and 1,000 mile (400, 800, 1,500 km.) intervals during the running-in period and thereafter as stated in Section A1.

It is always advisable to drain the oil when it is warm as it will flow more readily.

Remove the crankcase undershield. This is retained by two bolts.

Remove the oil reservoir filler cap that is situated behind the head lug. Remove the filter from the reservoir; this is screwed into the base of the front frame down tube, and then drain the oil into a suitable receptacle (See Fig. A3). This operation only allows $1\frac{3}{4}$ pints of oil to drain out. The remainder of the oil is drained by means of a plug situated at the rearmost part of the top main frame tube. To gain access to this plug first remove the right hand side panel by means of the two quick release fasteners.

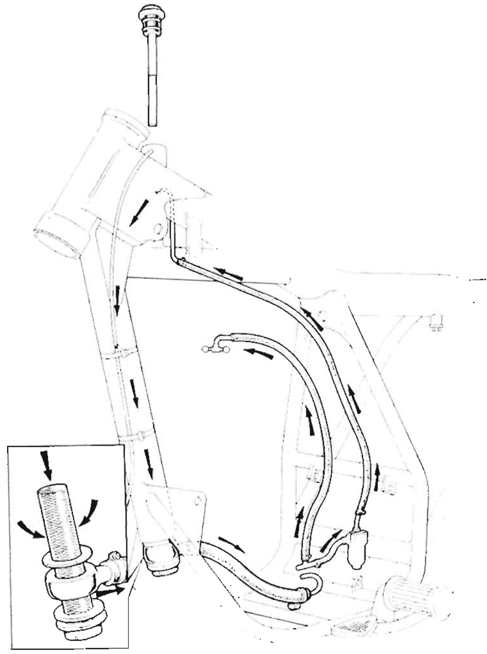


Fig. A3. **Oil reservoir and dipstick.**

Remove the plug and allow the oil to drain onto a suitable chute and into a convenient receptacle. (A chute can be easily constructed from a piece of cardboard shaped into a trough.) Clean the reservoir filter with fuel and replace. The gasket should be replaced to ensure a good oil tight joint. Again using a suitable container to catch the oil, unscrew the four self-locking nuts holding the sump filter to the crankcase and remove the filter. Allow the oil to drain, wash the filter thoroughly in petrol and clean the joint faces between the filter and crankcase. If there is any sign of damage to the old gasket, replace it on reassembly. Replace the undershield. Refill the reservoir with engine oil in accordance with the recommendations on page A3. The reservoir capacity is 4 pints. Refit the oil cap.

An external filter is situated at the rear of the gearbox and is bolted to the rear engine plate, using two self-locking nuts. The centre bolt retaining the filter housing lies at the base of the filter and is accessable from underneath the machine. The element is disposable and should be replaced at the interval shown on page A2.

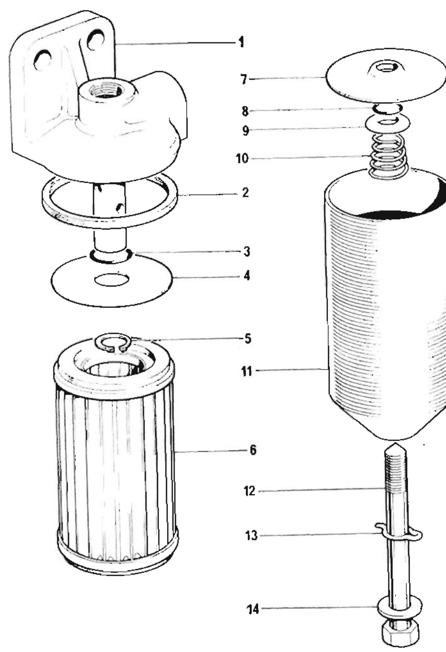


Fig. A4. Oil Filter

SECTION A5

SCAVENGE NON-RETURN VALVE

Whilst changing the oil it is a good point 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. Check for crushing of the filter screen in the area of the scavenge pipe prior to re-assembly.

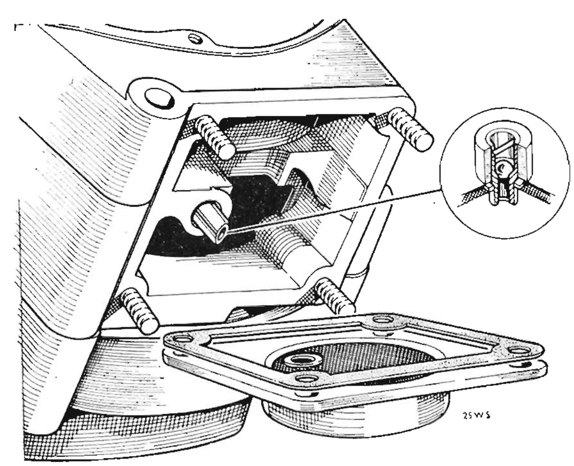


Fig. A5. Scavenge Non-return Valve

SECTION A6

FEED NON-RETURN VALVE

If there has been a tendency for the crankcase to fill with oil after standing overnight, so causing the engine to emit clouds of smoke when started, it is quite possible that the feed line non-return valve is not seating properly thus allowing oil to run back from the reservoir. This is the valve in the inner timing cover described in Section A10.

SECTION A7

CRANKCASE OIL PIPE UNION

The oil pipes are individually screwed into the crankcase. To remove the pipes from the crankcase, first of all disconnect the rubber take-off pipes by loosening the securing clips. Then loosen the two locknuts and unscrew the oil pipes from the crankcase. When reassembling ensure that the threads on the oil pipes are thoroughly cleaned in fuel.

Note: On machines subsequent to engine No. CE.07500 T25T, a shorter return rubber pipe was used. It can make correct assembly of the rubber pipe onto the union difficult, therefore care must be taken to ensure that the pipe is pushed well onto the union before the tightening the clip.

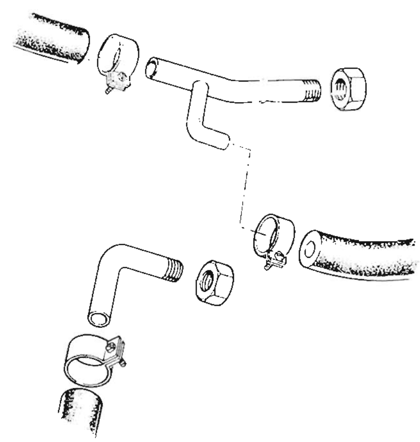


Fig. A6. Crankcase oil pipe union

SECTION A8

OIL PRESSURE RELEASE VALVE

The oil pressure release valve is very reliable and should require no maintenance other than cleaning. It is situated on the front of the crankcase (see Fig. A7). Oil pressure is governed by the single spring situated within the valve body. When the spring is removed it can be checked for compressive strength by measuring the length and checking against the figure given in General Data.

When the valve has been removed the hexagonal domed cap can be unscrewed from the main body, so releasing the piston which should be withdrawn.

Thoroughly clean all parts in paraffin (kerosene) and inspect for wear. The piston should be checked for possible scoring and the springs for signs of fracture and also length. To reassemble the release valve unit offer the piston into the valve body and screw on the valve cap with new fibre washers. Similarly, when screwing the release valve unit into the crankcase, fit a new fibre washer between the release valve body and the crankcase.

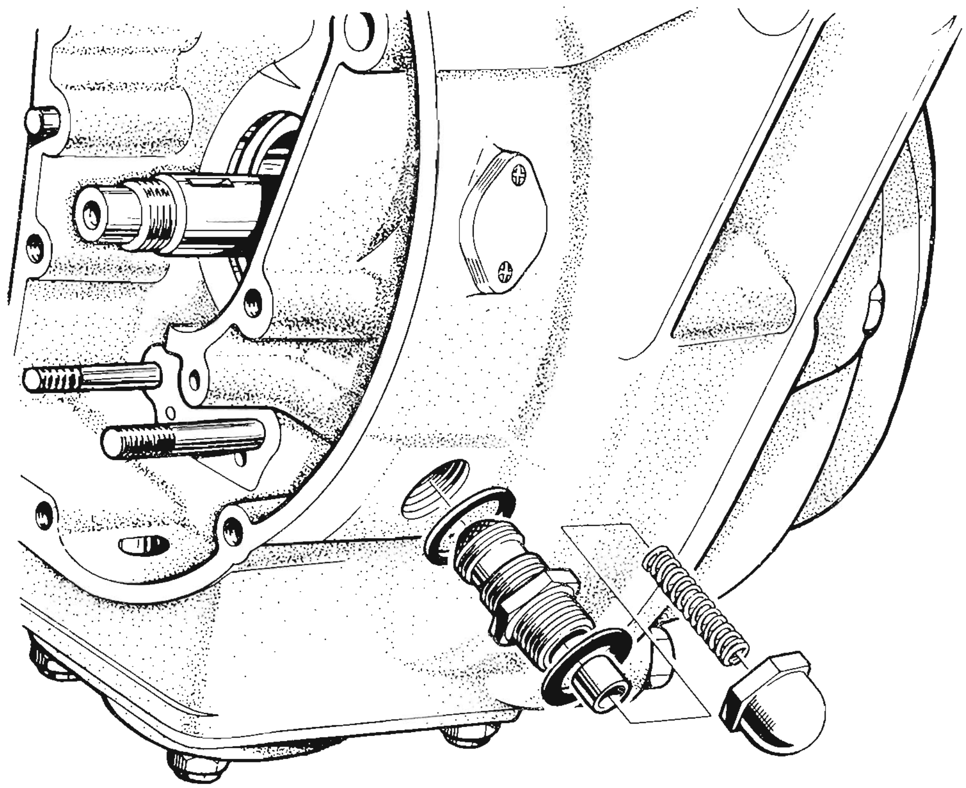


Fig. A7. Pressure release valve

SECTION A9

LOW OIL PRESSURE

Normal oil pressure when the engine is hot should be 60/75 lb./sq. in. at 4000/4500 r.p.m. This is indicated by fitting an oil pressure gauge in place of the oil pressure switch

If the oil pressure is below the quoted figure the following procedure should be followed:

(1) Ensure that the oil level in the reservoir is above the minimum line.

(2) Remove both the oil reservoir and sump filters and thoroughly clean to ensure a free passage of oil.

(3) Ensure that the oil pipes are correctly connected, i.e. not reversed.

(4) Remove and examine the pressure release valve as mentioned in Section A8.

(5) Examine the crankshaft oil seal and retaining circlip as described in Section B.

(6) Ensure that both oil way plugs shown in Fig. A8 are screwed flush with the casting, and are secured by centre punching the alloy casting into both ends of each screwdriver slot.

(7) Remove the oil pump and measure the exposed length of the locating dowels. If this length is not $\frac{1}{32}$in. less than the depth of counterbore in the pump body, the dowels must be shortened to ensure proper mating.

(8) If the previous examinations prove unsatisfactory the oil pump should be checked as described in Section A11. The correct pump should have "S" stamped on the top spindle housing. If "V" is shown the pump must be replaced with the correct type.

SECTION A10

SYPHONING

This, one of the more common troubles, happens when one of the non-return ball valves is sticking off its seating. It can also be caused by a badly worn pump or one which is loose on its mounting.

Indications of syphoning are clouds of smoke from the exhaust when the engine is first started after standing overnight.

The feed line non-return valve consists of a ball and spring and is located in the inner timing cover (see Fig. A8). After unscrewing the retaining plug, the valve spring and ball can be removed for examination.

Should there be any doubt about the condition of the valve components renew them, since they are quite inexpensive.

The non-return valve in the scavenge pipe is described on page A5.

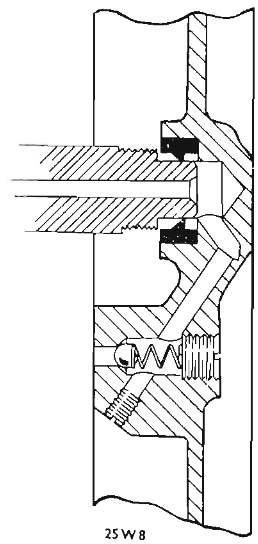


Fig. A8. Non-return valve

SECTION A11

DISMANTLING AND REASSEMBLING THE OIL PUMP

Having removed the oil pump from the engine, take out the four screws from base of 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 one nut and spring washer. Before removing the worm gear, make careful note of the way in which it is fitted to assist in reassembly.

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 the oil changing has been neglected. Slight marks can be ignored, but any metal embedded in the gear teeth must be removed.

The most likely point of wear will be found on the driving gear teeth; if these are worn to the extent that the sharp edges have gone then they must be renewed.

REBUILDING THE PUMP

Absolute cleanliness is essential when rebuilding the oil pump.

Insert the driving spindle (with fixed gear) into pump top cover, fit the worm drive and secure in position with nut and spring washer.

Fit the driven spindle and gear into the cover. Place the assembly on top of the pump body and insert the lower gears. Apply clean oil to the gears and refit the base plate. Check that the spindle and gears rotate easily before tightening the four fixing screws.

Finally, check that the joint surfaces are parallel since if the housing face is not level, it will be distorted when bolted to the crankcase and may prevent the pump from working.

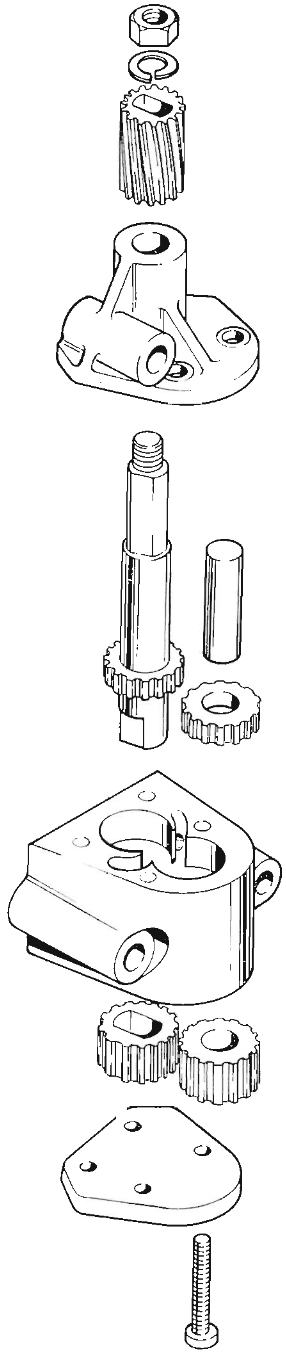


Fig. A9. Oil pump exploded

CRANKCASE BREATHER

A short crankcase breather pipe emerges from the timing case alongside the clutch cable abutment (See Fig. A10). It is most important that periodic checks are made to ensure that this pipe remains unobstructed.

When a machine is used in competition events or at continued high speeds, it may be necessary to provide a pressure outlet at the gearbox to prevent oil leakage. This can be accomplished by drilling a small hole through the oil filler plug.

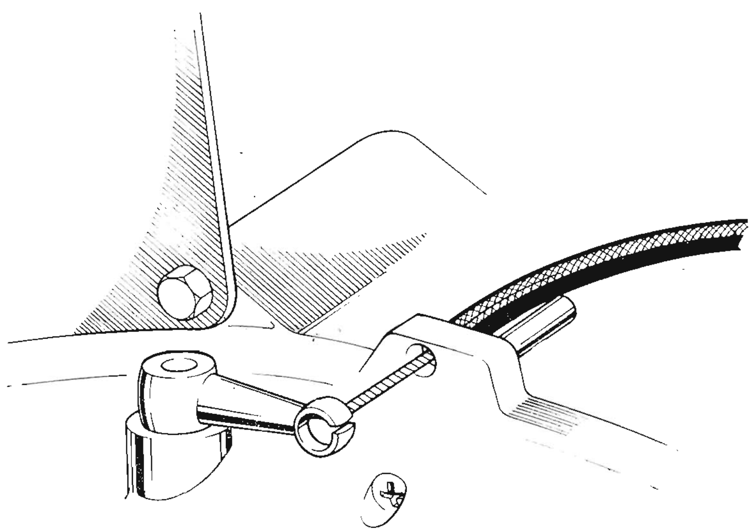


Fig. A10. Crankcase breather

SECTION A12

CONTACT BREAKER

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

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

The contact breaker moving point has a nylon heel which requires lubrication and for this purpose there is a felt lubricating wick resting on the cam adjacent to the heel. Initially this is treated with Shell Retinax A grease, and at 2,000 mile intervals, 3 drops of clean engine oil should be added to the wick at the opposite end to the cam.

To lubricate the auto-advance unit it is necessary to remove the contact breaker plate. First mark across the plate and the housing so that it can be replaced in exactly the same position. Take out the fixing screws and withdraw the contact breaker plate.

The pivot points of the auto-advance unit should be lightly oiled, at 5,000 mile (8,000 km.) intervals.

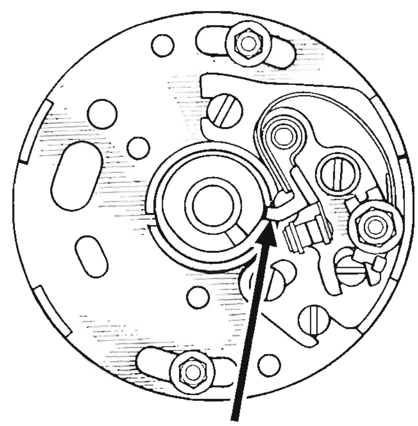


Fig. A11. Contact breaker

After lubricating, replace the plate to the marks, but if the timing has been upset, follow the instructions in Section B29.

SECTION A13

GEARBOX LUBRICATION

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

For this purpose a nylon filler plug with dipstick is fitted. The dipstick has a line marking only to indicate the correct oil level.

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

To drain the gearbox, take out the nylon filler plug and dipstick on top of the gearbox then unscrew and take out the plug underneath, draining the oil into a suitable receptacle.

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

Now fill the gearbox with fresh oil and check the level with the dipstick provided.

Recommended grades of oil are quoted in Section A2, capacities on page GD5 and checking frequency in Section A1.

SECTION A14

PRIMARY DRIVE

Like the gearbox, the primary chaincase, having its own lubricant, is independent of the engine but the level of oil must be checked periodically and the oil drained and replaced as indicated in the routine maintenance sheet, Section A1.

A drip feed is also provided for the rear chain through an oil well and nozzle at the back of the chaincase.

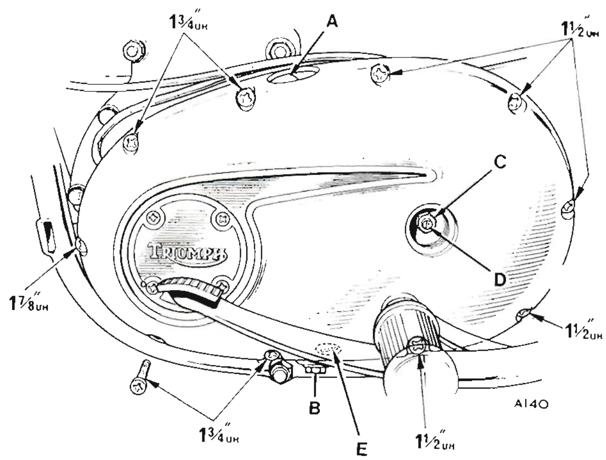


Fig. A12. Chaincase plugs and screw positions

A chaincase drain plug is fitted vertically into the primary chaincase and the level screw is fitted directly above this. See Fig. A12.

To drain the oil, take out the chain inspection cap (1) at the top of the case and the drain screw.

Cap (2) is only removed to enable clutch adjustments to be carried out.

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

Oil containing molybdenum disulphide or graphite must **not** be used in the primary chaincase.

When replenishing, use only the grades recommended in Section A2.

SECTION A15

REAR CHAIN

The best method of lubrication is to remove the chain every 2,000 miles, wash thoroughly in paraffin and allow to drain, then immerse it in melted grease (melt over a pan of boiling water) and allow to remain in the grease for approximately 15 minutes to ensure good penetration.

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

Note that the T25T has a chain guide incorporated in the chainguard for the lower chain run.

SECTION A16

STEERING HEAD

The steering head bearings are packed with grease on assembly and only require repacking at the intervals quoted in Section A1. Removal and replacement of the steering is dealt with in Section E2 in the fork section.

Wipe the grease from the rollers with a clean cloth and clean the bearing face thoroughly. Examine the rollers and the bearing face for pitting, corrosion or cracks and renew if necessary. Check that the grease is as quoted in Section A2.

SECTION A17

TELESCOPIC FORK

The oil contained in the fork legs not only lubricates the bearing surfaces, but also 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 quantity and viscosity.

Oil leakage midway up the forks usually indicates that an oil seal has failed and requires replacement; this is dealt with in Section E3.

Correct period for changing the oil is every 10,000 miles (16,000 km.) but some owners may not cover this mileage in a year, in which case it is suggested that the oil be changed every 12 months.

To drain the oil, unscrew the fork cap nuts and the small drain plugs in the lower ends of the fork sliding members. Allow the oil to drain out then, whilst standing astride the machine, apply the front brake and depress the forks a few times to drain any oil remaining in the system.

Replace the drain plugs, remove the cap nuts and pour $\frac{1}{3}$ pint (190 c.c.) of oil into each fork leg (see Section A2 for recommended grades of oil).

SECTION A18

WHEEL BEARINGS

The wheel bearings are packed with grease on assembly and only require repacking at the intervals given in Section A1.

The bearing should be removed as quoted in Sections F2 and F7. 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.

Do not over-lubricate and avoid handling the brake shoes with greasy hands.

SECTION A19

LUBRICATING THE CONTROL CABLES

The control cables can be periodically lubricated at the exposed joints with a thin grade of oil (see Section A1).

A more thorough method of lubrication is that of feeding oil into one end of the cable by means of a reservoir. For this, the cable can be either disconnected at the handlebar end only, or completely removed.

The disconnected end of the cable should be threaded through a thin rubber stopper and the stopper pressed into a suitable narrow-necked can with a hole in its base. If the can is then inverted and the lubricating oil poured into it through the hole, the oil will trickle down between the outer and inner cables. It is best to leave the cable in this position overnight to ensure adequate lubrication.

Note that the clutch cable has an oil nipple situated in the outer casing of the clutch cable. A pressure oil can should be applied until oil escapes at either end of the cable.

SECTION A20

SPEEDOMETER (AND TACHOMETER CABLE WHERE FITTED)

It is necessary to lubricate the cables to prevent premature failure of the inner wires. Care is also necessary to avoid over-zealous greasing which may result in the lubricant entering the instrument heads. For lubricating, it is only necessary to unscrew the cable ferrules and withdraw the inner wires. The grease should be applied sparingly to the wires and the top 6 in. must not be greased.

SECTION B

ENGINE

INDEX

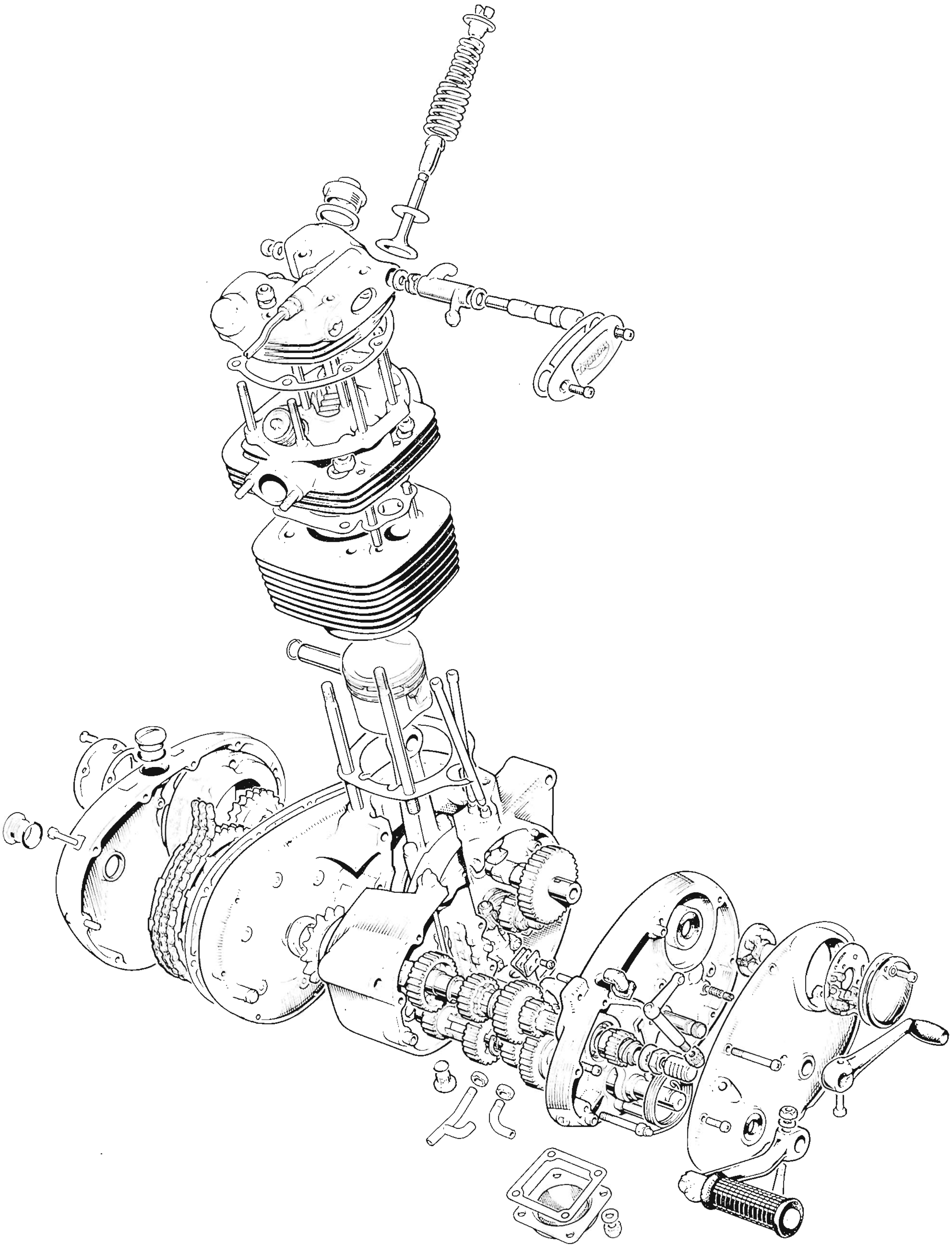


Fig. B1. Engine exploded.

DESCRIPTION

The 250 c.c. overhead valve single cylinder four-stroke engine is of the unit construction type and incorporates an aluminium alloy cylinder barrel which has an austenitic iron liner.

The aluminium alloy die-cast piston has one plain compression ring, one tapered compression ring, and a scraper ring. The connecting rod is of H-section Hiduminium alloy.

Four special bolts hold each of the two flywheels to the one-piece forged crankshaft. Incorporated in the right-hand flywheel is a centrifugal oil sludge trap, fitted with a screwed plug. The bolt-on connecting rod big-end assembly consists of two bearing shell halves, available in three undersizes for use with reground crankshafts.

The aluminium alloy cylinder head has cast-in, heavy duty cast-iron valve seats and removable valve guides. Housed within the top of the cylinder head are two valve rocker spindles, carrying the inlet rocker at the rear and the exhaust rocker at the front. Each of the valve rocker spindles has an eccentric cam which provides a means of adjusting the valve clearances.

The high performance camshaft operates in two bushes, one of phosphor bronze and the other of sintered bronze.

Contained within the primary drive case on the left-hand half of the crankcase are the clutch assembly, primary chain and the alternator. The alternator unit consists of an encapsulated six-coil stator, mounted on three studs, and a rotor secured to the drive-side shaft.

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

The gearbox, at the rear of the right-hand half of the crankcase, and the primary chaincase are independent of the engine lubrication system and each contain their own lubricant.

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

SECTION B1

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 will be taken to examine the valves, valve seats, springs, guides, etc, for general "wear and tear", hence the term "top overhaul".

Carbon, produced by combustion taking place in the engine when running, is not harmful providing it is not allowed to become excessive and therefore likely to cause pre-ignition or other symptoms which may impair performance.

The usual symptoms indicating the need for decarbonising, are an increased tendency for the engine to "pink" (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 petrol 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.

To facilitate removal of the cylinder head for decarbonising, first take off the petrol tank, as detailed in Section D.

With the tank removed, the engine torque stay bracket can be disconnected.

The right-hand exhaust system is a push fit into the cylinder head. Remove the two fixing bolts situated at the silencer, loosen the clip securing the silencer to the exhaust pipe, disconnect the front fixing at the front engine bolt and then remove the exhaust pipe from the cylinder head. The pipe may be a tight fit and may require tapping with a rubber mallet or similar.

Remove the carburetter from the cylinder head and tie it back out of the way.

The oil feed pipe to the rocker spindles should now be disconnected and the sparking plug taken out.

REMOVING THE CYLINDER HEAD

Set the piston at top dead centre on the compression stroke (both valves closed) and take off the six nuts holding the cylinder head to the barrel.

Leave the rocker box assembly ir position on the cylinder head, and raise the latter until it clears its fixing studs. It will then be necessary to rotate the cylinder head assembly about the push rods so as to clear the frame top tube. The rocker box can now be removed from the cylinder head, thus exposing the valves and springs.

VALVE ROCKERS

Rocker arms which have been subjected to a great deal of wear, make the correct valve clearances difficult to determine. During their manufacture the pads are case-hardened and no attempt should be made to grind them smooth. If wear of this nature is apparent therefore, replacement parts should be fitted.

If the rockers and spindles are dismantled take care to renew any damaged washers.

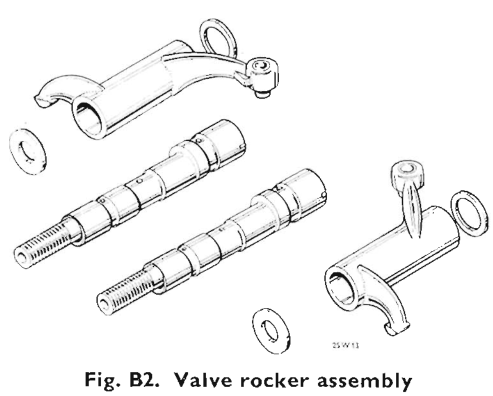


Fig. B2. Valve rocker assembly

REMOVING THE VALVE SPRINGS

Using a valve spring compressor, compress each spring until the split collets can be removed. The valve springs and top collars can now be lifted from the valve stems, rinsed in paraffin (Kerosene), then labelled inlet or exhaust as the case may be.

The springs may have settled through long use and they should therefore be checked in accordance with the dimensions quoted on page GD2.

If the springs have settled appreciably, or there are signs of cracking, they should be replaced.

PUSH RODS

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 (i.e., a piece of plate glass). If any of these faults are evident the rod(s) should be renewed. The exhaust push rod is the shorter and has a red identification mark on the top cup.

VALVE GUIDES

Check the valves in the 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 can be removed by careful scraping and very light use of fine grade emery cloth. If there are signs of scoring on the valve stems, indicating seizure, both valve and guide should be renewed.

A valve guide can be pressed out with service tool No. 61-6063, but the aluminium cylinder head should first be heated. The new guide can be pressed in with the same tool whilst the head is still warm.

Note that the exhaust guide is counterbored at the end which protrudes into the port.

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.

Oversize valve guides are available in 0·002 ins. and 0·015 ins.

VALVES

Valve heads can be refaced on a valve refacer but if pitting is deep or the valve head is burnt, then a new valve must be fitted and ground-in.

The valve seats in the cylinder head are unlikely to require any attention, but if they are marked, they should be refaced. Cutting tools are available under part number D1832, D1835 and D1863. The seat angle is 45 degrees.

Sometimes when the engine has been decarbonised many times, valves become "pocketed". This is when the valve head and seat are below the surface of the combustion chamber, so impairing the efficiency of the valve and affecting the gas flow. The "pocket" should be removed with a special blending cutter D1835 before re-cutting the seat or grinding-in the valve.

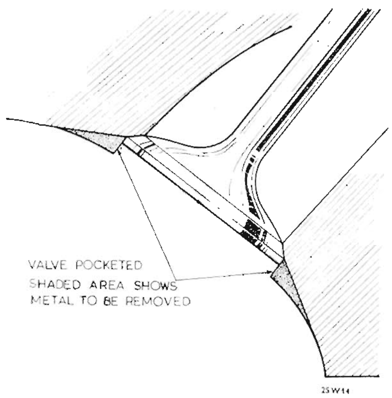


Fig. B3. Pocketed valve

VALVE GRINDING

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

This operation is carried out only after all carbon deposits have been removed from the combustion chamber.

Removal of carbon from the head, inlet and exhaust ports can be carried out with scrapers or rotary files, but whichever method is used great care must be taken to avoid scoring the valve seats or cylinder head.

A final "polish" can be achieved with the use of fine emery cloth wetted by paraffin.

Do not attempt to decarbonise the cylinder head by immersing it in caustic soda solution; the solution has a harmful effect on aluminium.

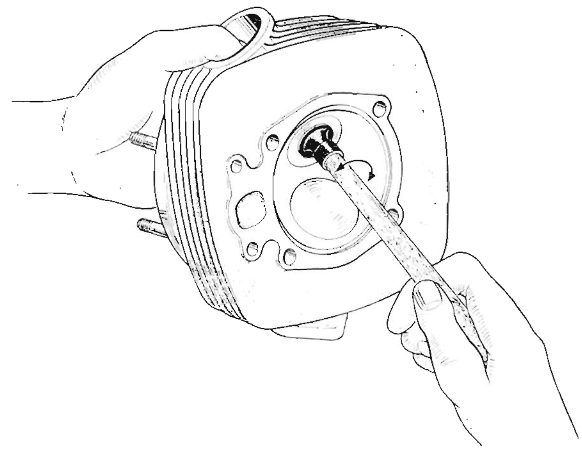


Fig. B4. Grinding-in valve

Having removed all traces of carbon, smear a small quantity of fine grinding paste over the face of the valve and return the valve to its seat

Now, using a valve grinding tool, 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 to enable it to be re-positioned.

Grinding should be continued until the mating surface 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 re-cutting 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 the valves and their 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 use a valve spring compressor 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 valve springs are released. Make sure that the collets are correctly seated in the recess on the valve stem.

Refer to "Removing the valve springs" for information on modified collers and collets.

CLEANING THE PISTON CROWN

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 barrel is not being removed, bring the piston to the top of the bore and, after plugging the push rod opening with clean rag, proceed to remove the carbon from the piston crown. A stick of tinsmiths solder, flattened at one end, provides an ideal scraper tool and will not damage the alloy piston.

If possible 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 any loose carbon from the cylinder wall.

The cylinder barrel and head joint faces must also be cleaned, care being taken not to damage the faces by scoring with the scraper.

Such score marks would result in gas leakage, loss of compression or even burning of the cylinder head face.

RE-FITTING THE CYLINDER HEAD

Insert the two push rods down the barrel aperture, on to their respective tappets, the outer one operating the inlet push rod (see Fig. B5).

Place the cylinder head gasket in position and refit the head, complete with rocker box.

The push rod inspection cover should be removed so that the upper ends of the rods can be fitted to their appropriate rocker arms. Note that the top of the exhaust push rod is painted red for identification purposes, and is the shorter.

In order to avoid any undue strain on the head or rocker box from valve spring pressure, the piston should be set at top dead centre on the compression stroke.

Now, using a suitable torque wrench, tighten the six cylinder head fixing nuts firmly and evenly to the figures quoted on page GD5. Check that the push rods are correctly located in their proper positions and tighten the rocker box fixing nuts.

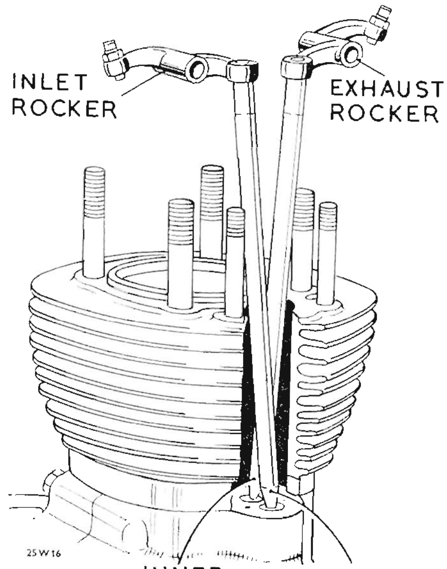


Fig. B5. Fitting the pushrods

Check the valve clearances as described below and replace the sparking plug.

Proceed by fitting the carburetter, together with its sealing washers and tighten the fixing nuts to a torque wrench setting of 10 lb./ft. Reconnect the rocker oil feed pipe.

Replace the exhaust pipe and secure in position with the front engine mounting bolt. Refit the silencer.

If the engine was removed for decarbonising, see Section B7 for details of replacement.

SECTION B2

CHECKING VALVE CLEARANCES

The clearances between the top of each valve stem and the rocker arm, must be set when the motor is quite cold, the clearance being 0.008 in. (inlet) and 0.010 in. (exhaust).

Remove the rocker caps and take out the spark plug, to enable the engine to be rotated easily by hand.

Rotate the engine forward until the inlet valve has just closed i.e. the pushrod is just free to rotate.

This is the correct position for checking or adjusting the exhaust valve clearance using a feeler gauge.

When the exhaust valve clearance has been set, rotate the engine forward again until the clearance is taken up i.e. just before the valve starts to open.

This is the correct position for checking or adjusting the inlet valve clearance.

These motors have an eccentric cam on each rocker

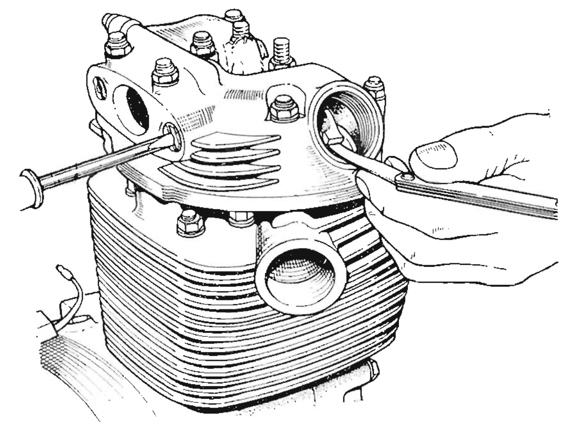


Fig. B6. Checking valve clearances

spindle, the valve clearances being adjusted in the following manner:—

Remove the cover plate to expose the slotted ends of the rocker spindles and slacken the locknuts on the opposite ends of the spindles. To ensure correct positioning of the rocker arms in relation to the valve stems, rotate the exhaust rocker spindle in a *clockwise* direction until the arm just touches the valve stem and then turn it back sufficiently to gain the correct clearance with the feeler gauge. The procedure for setting the inlet valve clearance is similar except that the inlet spindle must be rotated *anti-clockwise*. If the spindle bottoms on its thread, turn it back one complete turn and repeat the procedure.

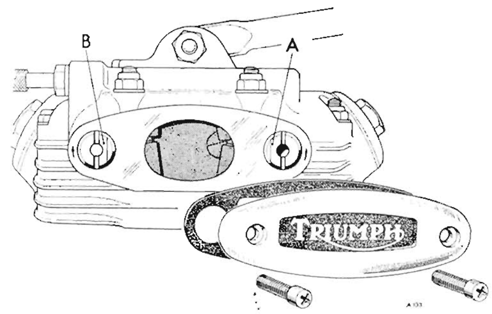


Fig. B7. Valve rocker adjustment

When the necessary adjustments have been made, secure the spindles with their nuts and re-check the clearances.

Finally, replace the cover plate and gasket and refit the spark plug.

SECTION B3

REMOVING CYLINDER BARREL

If the bore is worn it can sometimes be detected by placing the fingers on top of the piston and attempting to push the piston backwards and forwards in the direction of flywheel rotation. Symptoms indicating faulty piston rings might include heavy oil consumption and poor compression, but only if the valves are known to be in good order. If the valves require attention they are much more likely to be the cause of such symptoms.

Excessive piston slap when warm may indicate a worn bore or severe damage through seizure.

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

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 violent contact with the crankcase mouth. As soon as the cylinder has been withdrawn, cover the crankcase with a clean rag to prevent the entry of foreign matter.

Examine the cylinder carefully for wear and if a deep ridge has formed at the top of the bore then the barrel will require attention.

The barrel will also require attention if there is any deep scoring as this will cause loss of compression and excessive oil consumption.

The cylinder barrel is fitted with an austenitic iron liner, enabling a rebore to be carried out for use with oversize pistons. The recommended oversizes are $\frac{1}{2}$ mm., .020 in. and 1 mm., .040 in.

SECTION B4

REMOVING THE PISTON

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

To remove the piston from its connecting rod, it will first be necessary to prise out one of the gudgeon pin circlips using a suitable pointed instrument in the notch provided.

To remove the gudgeon pin, warm the piston thoroughly, using a rag which has been soaked in very hot water and wrung out.

The gudgeon pin can then be pushed out using a suitable drift.

Only if the connecting rod is supported very securely and protected against scratching, can the pin be removed safely with a suitable drift and hammer.

If the gudgeon pin comes out easily before the piston is warm then the pin or piston is worn and will need replacement.

After freeing the piston, mark the inside of the piston skirt so that it can be replaced the correct way round.

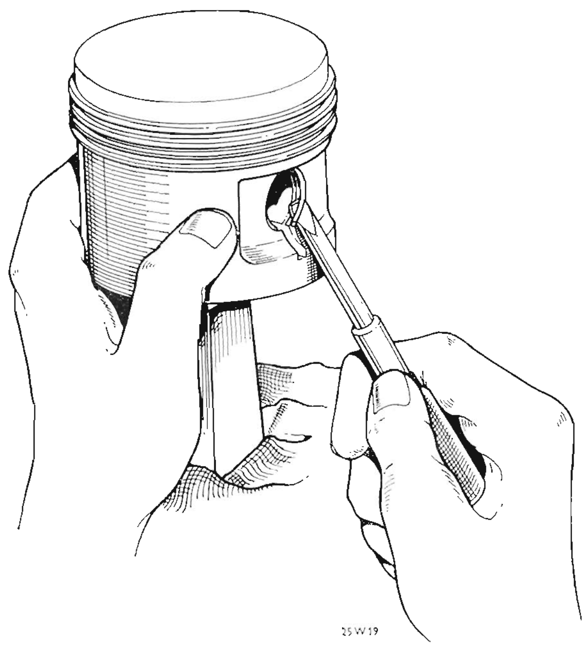


Fig. B8. Removing circlip

SECTION B5

PISTON RINGS

The outside face of each piston ring should possess a smooth metallic surface and any signs of discolouration means that the rings are in need of replacement.

The rings should also retain a certain amount of "springiness" so that when released from the barrel, the end of each ring lie at least $\frac{3}{16}$ in. 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 the 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 can be broken easily.

A piece of a broken piston ring, ground as a chisel, will provide 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 (usually 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 gap when new is between ·009/·013 in. and although an increase of a few thousandths of an inch is permissible, any large increase to, say ·025 in. indicates the need for a replacement ring.

It is advisable to check the gap of a new ring before fitting, and if the gap is less than 0·009 in. the ends of the ring must be carefully filed to the correct limit.

The top compression ring is of plain section and must always be used at the top. The second compression ring has a taper outside face and its upper surface is marked "top" to ensure correct fitting.

If the ring is fitted upside down, oil consumption will become excessive.

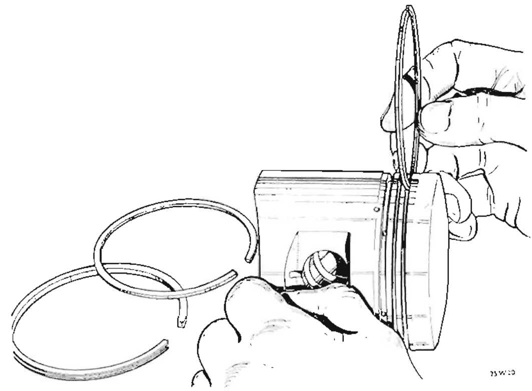


Fig. B9. Checking ring grooves

SECTION B6

REFITTING CYLINDER BARREL

Scrupulous cleanliness must be observed when reassembling, and each component should be smeared with fresh 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 see they are pressed well down into their grooves.

If the circlips should come adrift or if one is omitted, the cylinder barrel will be damaged and may require replacement.

Note that the studs on each side of the push rod tunnel have the greater thread length into the cylinder barrel.

Use a new cylinder base washer and support the piston with two pieces of hardwood placed across the crankcase, under the piston skirt.

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

Using the piston ring slipper service tool No. 61-6031 compress the rings so that they are just free to move and replace 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.

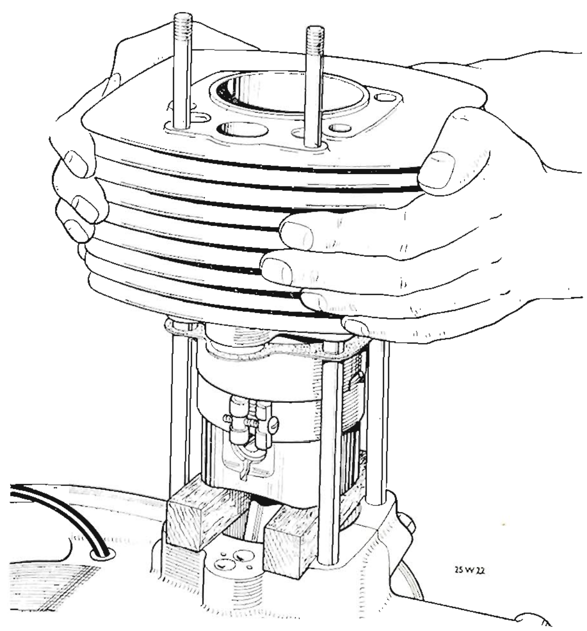


Fig. B11. Replacing cylinder barrel

SECTION B7

REMOVING THE ENGINE UNIT

During the process of removing the engine unit, keep careful watch for any nuts or bolts which are found to be loose or have worn considerably.

Such parts are no longer safe and must be replaced.

Examine the wiring for places where the insulation may have rubbed through and protect with a few turns of good insulating tape. The owner should bear in mind that a bare wire can cause an electrical short-circuit which may set the machine on fire.

Procedure for removal of the engine unit is as follows:—

(a) First, remove the petrol tank. See Section D15.

(b) Release the exhaust pipe from the front engine mounting, remove the silencer. The exhaust pipe is a push-fit into the cylinder head port and can now be withdrawn from the front.

(c) Drain the oil reservoir and system as detailed in Section A4 then uncouple the rocker oil feed pipe and the supply and scavenge pipes beneath the crankcase.

(d) Disconnect the generator, oil pressure switch and the contact breaker leads from their snap connectors at the electrical box. Also disconnect the high-tension lead and take out the sparking plug to prevent damage.

(e) Loosen the clip securing the air filter connecting tube to the carburetter and pull away from the carburetter intake.

On removal of the flange fixing nuts, the carburetter can be withdrawn from its studs and tied up out of the way.

(f) Detach the engine head steady bracket.

(g) Remove the chainguard (see Section D2), uncouple the rear chain at its spring link and detach it from the gearbox sprocket. Finally, disconnect the clutch cable from the operating lever on top of the timing cover.

(h) Remove the crankcase undershield which is retained by two nuts at the front and two location slots at the rear. The (footrest) bolt will have to be loosened to allow the undershield to be removed from the frame. Allow the right footrest to swing clear.

The engine/gearbox unit is mounted in the frame at three points. At the rear the attachment is by two triangular plates attached to the frame tube, the engine being held by two bolts and nuts. A second fixing point is located below the crankcase, comprising one long bolt through the crankcase and frame lugs. The third attachment point is at the frame front down tube.

Disengage the engine from the frame brackets and lift out from the right-hand side.

Replacement of the engine unit is a reversal of the above procedure. Ensure that all nuts, bolts and electrical connections are securely tightened. Take care to replace the two spacers correctly on the right side of the engine. A final check must be made to ensure that all nuts and bolts are tightened securely and that the handlebar controls are suitably re-adjusted.

SECTION B8

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 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, 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 part. In other words, if one part is worn or faulty, it can very often prevent other parts from working properly.

The dismantling and reassembly of the primary drive can if necessary, be carried out with the engine unit in the frame, but will be treated in the following notes, as though the unit were on a work bench.

SECTION B9

REMOVING PRIMARY CHAINCASE COVER

The primary chaincase cover is held in place by ten Phillips-head screws. (See Fig. A12 for position of screws).

The drain plug is fitted vertically into the bottom of the chaincase. (See Fig. A12).

The oil level plug is located immediately above the drain plug. (See Fig. A12(E)).

Drain the oil as described in Section A14 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. If the joint has not already been broken, tap the cover gently with a hide mallet to release, but have a suitable receptacle underneath to catch any remaining oil.

SECTION B10

CLUTCH DISMANTLING

Remove the four spring retaining nuts (P) Fig. B16, and withdraw the springs with their cups. The pressure plate and the remaining clutch plates can then be taken out. If these are the only items requiring attention, the clutch need not be dismantled further.

Before unscrewing the clutch centre nut, it will be necessary to lock the chainwheel and centre together with clutch locking tool 61-3774 and to insert a bar through the connecting rod small-end eye. If a service tool is not available, engage top gear and lock the gearbox sprocket with a length of chain in a vice. Flatten the tab washer under the clutch centre nut and unscrew the nut, which has a normal right-hand thread.

Take off the nut, tab washer and distance piece. The clutch push rod may now be withdrawn but do not attempt to remove the chainwheel at this stage. The generator must be removed as in Section B11 before the chainwheel is disturbed.

Note. Alternatively, the clutch sprocket may be removed by prising out the twenty five roller bearings and allowing the sprocket to move both outwards and forwards until it can be unmeshed from the primary chain. This alternative only applies if the shock absorber assembly can readily be detached from the hub to allow access to the rollers.

SECTION B11

GENERATOR REMOVAL

The generator comprises the rotor, fitted to the engine shaft, and the stator which is mounted on three studs around the rotor, both being detailed in Section G1.

Before the clutch chainwheel, chain or engine sprocket can be removed, the generator must be taken off.

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

The primary chain tensioner can now be taken off but note that the small spacer is fitted on the rear stud.

Bend back the tab of the lockwasher under the engine shaft nut and unscrew the nut (right-hand thread). Pull off the rotor and take out the small Woodruff key from the shaft to avoid losing it.

Using extractor tool 61-3583, the clutch sleeve can now be freed from the tapered mainshaft, enabling the clutch chainwheel, chain and engine sprocket to be withdrawn together.

SECTION B12

INSPECTING THE CLUTCH

The four driving plates have segments of special friction material which are securely bonded to the metal. These segments should all 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 in. (75 mm.), the plates should be replaced. Standard thickness is ·167 in. (4·242 mm.).

The tags on the outer edge of the plates should be a reasonable fit in the chainwheel slots and should not be burred. If there are burrs on the tags or the segments are damaged, the plates should be renewed.

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

Check the chainwheel for wear; if the slots are corrugated or the teeth are hooked and thin, the chainwheel should be replaced.

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

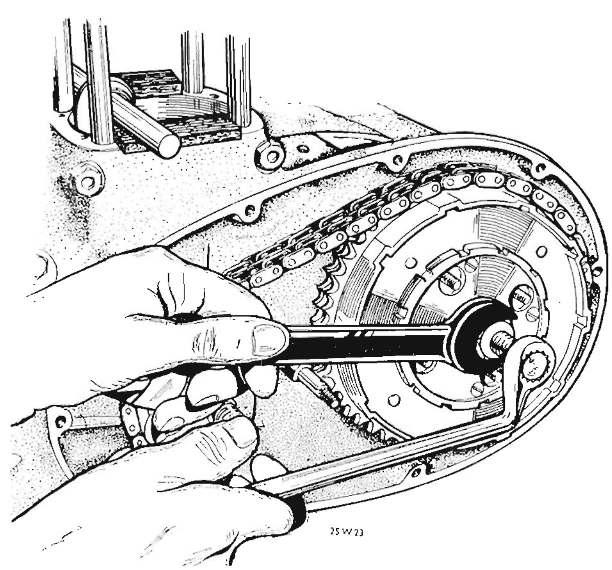


Fig. B12. Removing clutch

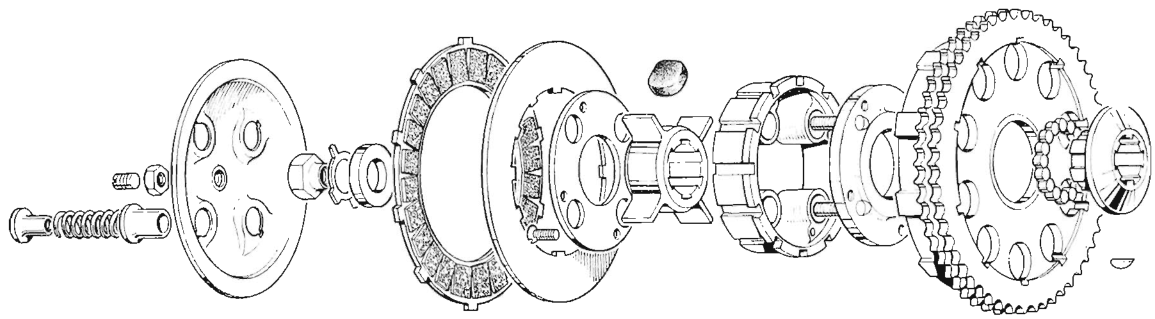


Fig. B13. Clutch exploded

SECTION B13

CLUTCH SHOCK ABSORBER UNIT

To inspect the shock absorber rubbers which are within the clutch centre, take out the four countersunk head screws adjacent to the clutch spring housings and prise off the retaining plate.

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

When refitting the shock absorber rubbers it may be found necessary to use a lubricant, in which case a liquid soap is recommended.

Do not use oil or grease.

SECTION B14

GEARBOX SPROCKET

Access to the gearbox sprocket can only be obtained when the clutch assembly has been removed.

Take out the six screws holding the circular plate at the back of the primary case, break the joint and remove the plate with its oil seal. (See Fig. B14).

Look for signs of oil leakage down the back of the cover. If leakage is evident, change the oil seal, taking care to see that it is fitted the correct way round 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 small oil seal. If the washer no longer appears serviceable, replace it.

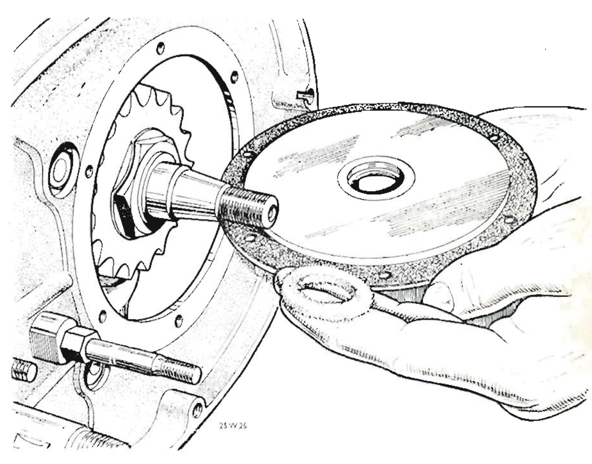


Fig. B14. Gearbox sprocket cover

If it is necessary to change or renew the gearbox sprocket, first place a length of chain round the sprocket and lock in a vice or with a suitable bolt, then flatten the tab washer and unscrew the large nut. The sprocket can now be pulled off the mainshaft splines.

If the oil seal is suspected of being faulty or leakage has occurred it should be renewed. Check that the sprocket boss is not worn or damaged as this would quickly damage a new seal.

If the sprocket boss is smooth and not scored it can be replaced, but lightly oil the boss to avoid damaging the seal as the sprocket is pressed home.

Reassemble in the reverse order but do not omit to turn the tab washer over the nut after tightening.

SECTION B15

CLUTCH OPERATION

As already indicated, the clutch, being part of the transmission system, carries power to the rear wheel, but by separating the driving and driven plates this connection is broken.

The disengagement is achieved by operating the clutch lever, the force imposed being transmitted via the clutch cable to the clutch lever in the timing case. The lever, working on the rack-and-pinion principle, drives the push rod through the hollow gearbox mainshaft, forcing the pressure plate out; so compressing the clutch springs and freeing the plates.

To ensure smooth clutch operation, it is essential that the spring pressures are equal and that the pressure plate runs "true".

See Section B16 for details of clutch adjustments.

SECTION B16

REASSEMBLING THE PRIMARY DRIVE

Place the felt grit protection washer in position against the sprocket securing nut and replace the circular cover, using a new paper gasket jointed on one side only.

If the clutch hub has been removed from the chainwheel, smear the sleeve with grease and place the 25 rollers in position. Now, slide the chainwheel over the rollers and fit the clutch centre over the splines of the sleeve.

Pass the stator lead through the front of the primary chaincase and clip in position behind the cylinder base. This operation may be found difficult if left to a later stage.

The engine shaft distance piece should not have been disturbed, but if it was removed for any reason, it must now be refitted with the chamfered side outwards.

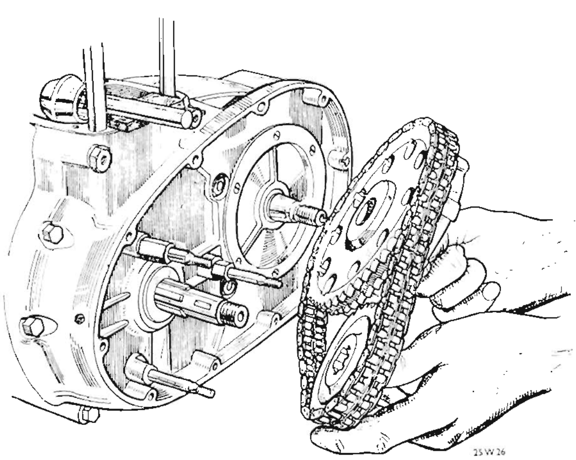


Fig. B15. Fitting primary drive

See that the Woodruff key is fitted to the gearbox mainshaft and it is a good fit in the keyway.

Place the primary chain around both the engine and clutch sprockets, pulling the chain taut.

Pick up the engine sprocket, chain and chainwheel with both hands and slide the sprockets on to their respective shafts. It will be necessary to turn the clutch chainwheel to locate over the keyed shaft. Place the thick washer with the recess outwards in position against the clutch hub then the tab washer and fixing nut. After tightening the nut, to the torque setting in General Data lock in position with the tab washer.

Replace the clutch plates, starting with one plain then one segmented plate and so on alternately, there being five plain plates and four segmented plates. Insert the clutch push rod into the hollow mainshaft.

Place the pressure plate in position and fit the four spring cups with springs, which should be of equal length. If in any doubt about the condition of the springs, replace them since they are quite inexpensive.

Screw on the four spring nuts (*P*) Fig. B16, with a slotted screwdriver 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. On the other hand, if the spring pressure is insufficient the clutch will tend to slip. Check the accuracy of the spring setting by declutching and depressing the kickstart lever, when it will be seen if the pressure plate is runnning "true" or not. If necessary, adjust each nut accordingly to correct any "run-out".

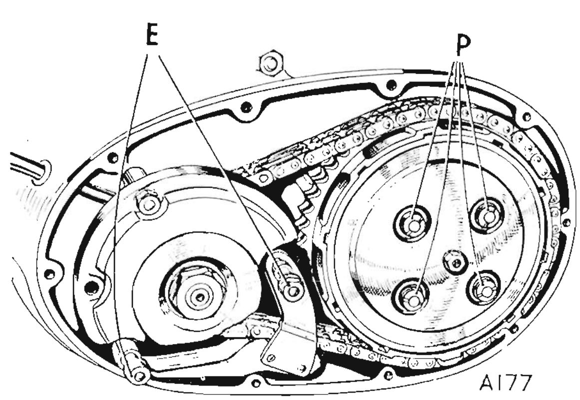


Fig. B16. Chain and pressure plate adjustment

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 clutch operating rod should have $\frac{1}{16}$ in. (1·5 mm.) clearance between the clutch operating mechanism and the pressure plate. To achieve this remove the inspection cap from the centre of the primary cover with the clutch cable either disconnected or the handlebar adjustment slackened right off.

Unscrew the hexagonal lock nut and screw in the slotted adjuster screw in the centre of the pressure plate until the pressure plate just begins to lift. Unscrew the adjuster one full turn and secure it in that position by re-tightening the lock-nut. The clutch operating cable should then be re-adjusted by means of the handlebar adjuster until there is approximately $\frac{1}{8}$ in. (3 mm.) free movement in the cable.

Fit the key to the crankshaft and replace the rotor on to the keyed engine shaft with its "Lucas" marked face outwards and fit the tab washer and nut, to the torque recommended in 'General Data' GD5.

Turn the tab over the nut after tightening securely.

Replace the primary chain tensioner on to the lower stator studs (*E*), Fig. B16, and fit the small spacer on to the rear stud.

Fit the stator on to its studs with the cable on the inside, at the front, and secure with the self-locking nuts. Adjust the primary chain tensioner to give approximately $\frac{1}{4}$ in. free play on the top run of the chain between the sprockets.

Having completed the assembly of the primary drive, the primary cover can now be replaced. Apply jointing cement to both faces of the chaincase and, using a new gasket, replace the cover. Ensure that the fixing screws are fitted in their correct positions (see Fig. A12).

See that the oil level and drain screws are correctly located in the lower edge of the case and refill the case with oil as in Section A14.

SECTION B17

CONTACT BREAKER AND AUTOMATIC ADVANCE AND RETARD UNIT

The contact breaker assembly is located behind the chromium plated circular cover on the right hand side of the engine. Access to the contact breaker assembly is gained by removing the chromium cover which is held by two screws.

The assembly comprises the contact breaker plate, on which are mounted the contacts. An oil seal is fitted in the back of the housing and prevents oil from reaching the assembly. The automatic advance/retard unit, mounted behind the plate, consists of two spring-loaded bob-weights coupled to the contact breaker cam and is secured by one central bolt and washer.

The bob-weights, when the engine is stationary, retain the contact breaker cam in the fully retarded position.

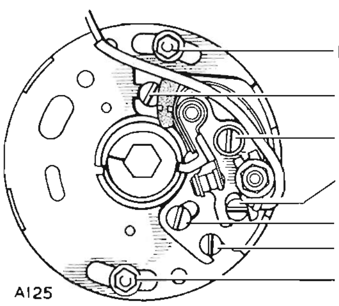


Fig. B17. Contact breaker unit

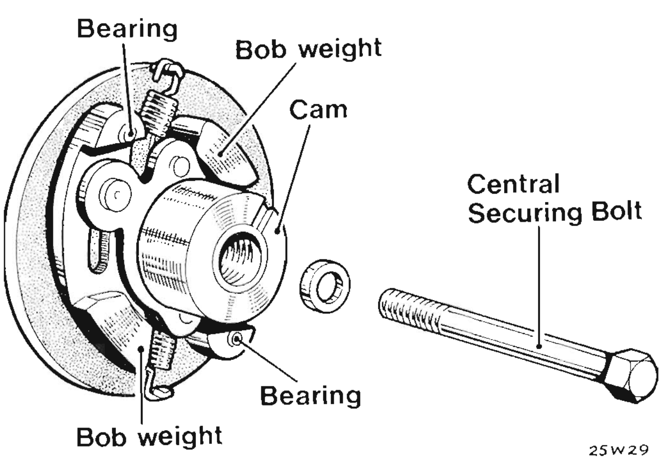


Fig. B18. Automatic advance and retard unit

As the engine revolutions increase, centrifugal force carries the bob-weights outwards progressively turning the cam into the direction of rotation, thus advancing the ignition.

The elongated holes in the contact plate enable the plate to be moved backwards and forwards around the cam, so providing a means of fine adjustment for ignition timing.

REMOVING THE AUTOMATIC ADVANCE AND RETARD UNIT

Disconnect the contact breaker lead at its snap connector, unscrew the two pillar bolts and take off the plate complete with contacts and cable.

To remove the auto-advance unit and cam, first take out the central fixing bolt then free the unit from its taper with service tool 61-3816.

Avoid removing the auto-advance unit unnecessarily as the timing will have to be reset. During re-assembly refit loosely and retime the ignition as detailed in Section B29.

CONTACT BREAKER POINTS

To remove the contact points, remove the nut, nylon insulating sleeve and contact breaker lead.

This releases the moving contact with the nylon heel which can then be lifted clear of the steel pivot. The contact adjusting screw (see Fig. B17) should be removed and the fixed point lifted clear of the secondary backplate.

When replacing, do not omit to fit the fibre washer between the moving point spring and fixed point plate.

It will now be necessary to reset the contact points gap after replacement. Turn the engine until the nylon heel is on the cam at the scribe marking, slacken the contact adjusting screw and turn the eccentric screw until, checking with a feeler gauge at 0·015 in. (0·381 mm.), the gap is correct. Re-tighten the contact adjusting screw.

It is advisable to check the ignition timing after carrying out any adjustment to the contact breaker points as a variation in the contact points gap tends to alter the timing. Widening the points gap advances the ignition; closing the gap retards the ignition. Although this variation is very slight, it must be remembered that accurate timing is important.

See Section B29 for full details of ignition timing.

SECTION B18

TIMING COVERS

To obtain access to the timing gears or the gearbox components it will be necessary to remove the covers on the right side of the engine. It will be assumed that the primary drive has been dismantled as described on previous pages.

To remove the outer cover, first take off the gear-change and kickstart pedals, then take out the ten cover retaining screws, noting their respective locations as shown in Fig. B19. The cover, complete with contact breaker plate and clutch operating mechanism, can now be withdrawn, exposing the auto-advance unit and kick-start mechanism. Note that the contact breaker lead is held by a spring clip under one of the inner timing cover screws.

If the clutch operating lever is to be removed, care must be taken to avoid losing the operating rack and ball which are loosely located on the inside of the outer cover. When reassembling the mechanism ensure that the operating lever is parallel with the joint face of the cover whilst the operating rack is flush with the end of its housing.

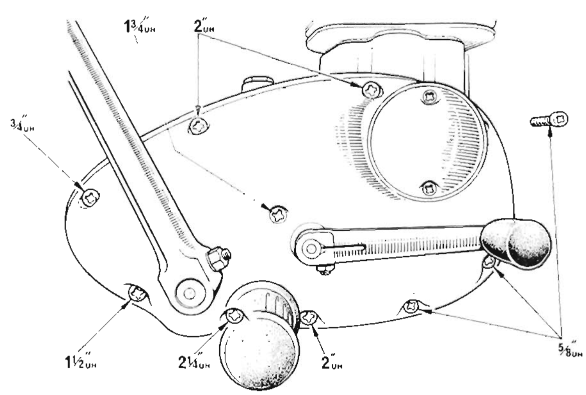


Fig. B19. Location of outer cover retaining screws

It is not necessary to remove the kickstart quadrant or spring unless they require attention.

If necessary free the spring from the kickstart spindle and withdraw the quadrant complete with layshaft needle bearing. When fitting a new spring, first locate the hooked end of the spring in the quadrant slot then "wind-up" the spring in a clockwise direction and slip the eye of the spring on to its stud. The quadrant bush is a push-fit into the outer timing cover.

Remove the contact breaker auto-advance unit as described in Section B17.

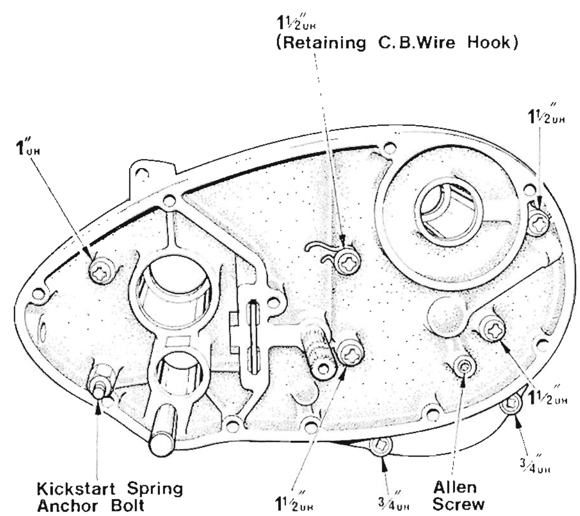


Fig. B20. Location of inner cover retaining screws

To remove the inner timing cover take out the seven fixing screws (see Fig. B20). Note that the contact breaker cable clip fits under the uppermost central fixing screw. Also unscrew the kickstart spring anchor bolt. The inner cover joint can be broken by tapping gently around the edges with a mallet.

The cover, complete with kickstart ratchet, gear cluster and gearchange assembly can now be eased away, leaving the oil pump and timing gears exposed.

Do not lose the loose fitting thrust washer on the end of the layshaft.

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 use.

Note that the contact breaker oil seal should be fitted with the lip inwards. Use the contact breaker oil seal protector part number Z168 when replacing the inner cover. Refer to Figs. B19 and 20 for location of screws.

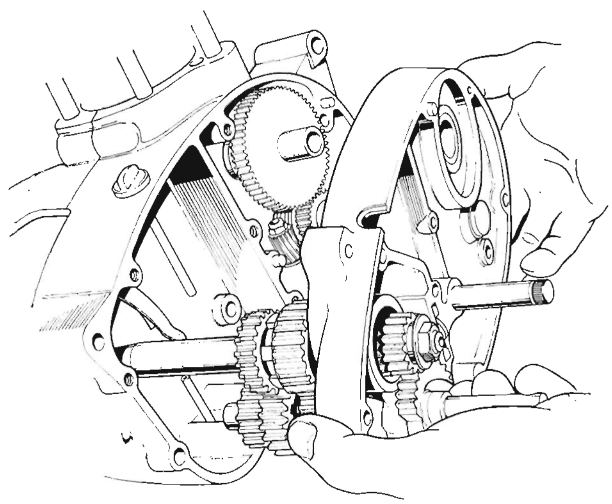


Fig. B21. Removing inner timing cover

SECTION B19

REMOVING AND REPLACING OIL PUMP

Use a suitable bar through the small end eye to lock the flywheel, flatten the tab washer under the crankshaft nut and unscrew the nut which has a normal right-hand thread.

Pull off the crankshaft pinion, using extractor No. 61-3808 with appropriate legs. The oil pump worm-drive need not be disturbed unless further engine dismantling is to be carried out, in which case the extractor should be used with the special legs.

Unscrew the three self-locking nuts from the main body of the pump and pull the pump off its studs.

It is not advisable to dismantle the oil pump unless it is suspected that there is possible damage caused by neglected oil changes.

Full details of dismantling and rebuilding the oil pump are given in Section A11.

Ensure that the joint faces are clean, apply a smear of grease to a new gasket and place the gasket in position on the crankcase face. Ensure that the gasket is not fitted back to front as this will cause a blockage. Locate the pump over the studs and replace the fixing nuts. Tighten evenly to a torque of 5 to 7 lb./ft.

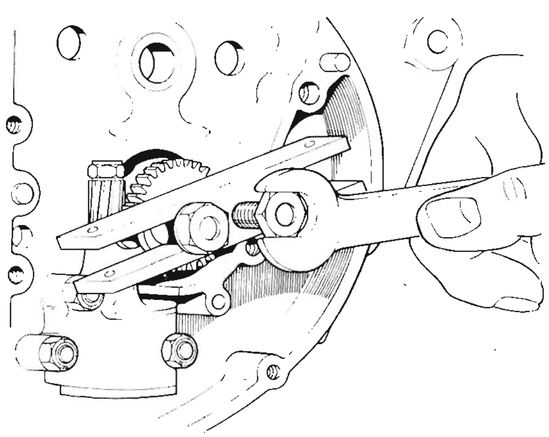


Fig. B22. Removing the timing pinion

SECTION B20

TIMING GEARS AND TAPPETS

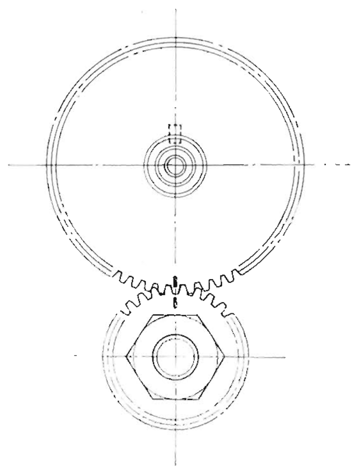


Fig. B23. Timing marks

Removal of the crankshaft pinion and oil pump wormdrive is described in Section B19.

Pull the camshaft, with pinion, from the crankcase and let the tappets fall clear. The pinion is a push-fit on the end of the camshaft.

Examine both ends of each tappet for signs of wear or chipping and make sure that they move freely 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 also be worn.

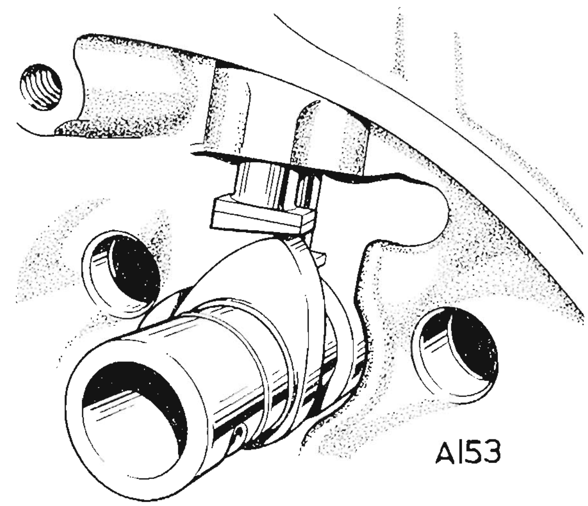


Fig. B24. Correct fitting of tappets

Note that one end of each tappet foot has been made slightly thinner than the other. When refitting, it is most important that this end faces towards the front, as indicated in Fig. B24. Ensure that the cam followers are fitted before the camshaft.

Reassembly of the timing gear is the reversal of the dismantling procedure. Care must be taken to match the timing marks on the pinions.

SECTION B21

SEQUENCE OF GEARCHANGING

The gearbox is operated by the pedal on the right side of the engine. The pedal is splined onto the quadrant which houses two spring loaded plungers. The plungers locate in "windows" in the camplate, and operate in such a manner that as the pedal is moved the camplate is relocated in the required position. This position is ascertained by a spring plate which locates in one of five notches on the end of the camplate. The arrangement of the selector mechanism is shown in Fig. B25. Two selector forks locate in tracks in the camplate and onto a sliding gear on each gear shaft.

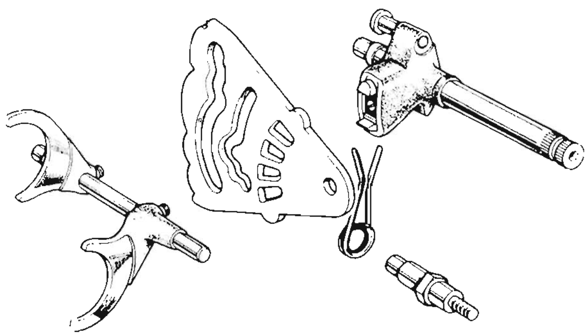


Fig. B25. Gearchange mechanism

Fig. B27 shows the camplate being held in the neutral position, i.e. the second notch. When first gear is selected by depressing the gearbox pedal, the lower quadrant plunger locates into a camplate window and lifts the camplate. The spring plate is ejected from the neutral notch and comes to rest in the first gear notch. During this movement the layshaft selector fork is relocated, which in turn causes the layshaft sliding gear to mesh with the layshaft first gear as shown in Fig. B26.

When the gear has been selected the quadrant returns to its original position. This allows the upper quadrant plunger to locate in the second window in readiness to move the camplate to the second gear position.

As the pedal is lifted to select second gear, the camplate moves downwards moving the layshaft selector fork to mesh the layshaft sliding gear with the second gear. The camplate is again located by the spring plate at this stage in the third notch as shown in Fig. B28. From the diagram it can be seen that the quadrant plungers are in a position to select third gear or return to either neutral or first gear.

When the camplate is moved to the third gear position, both selector forks are moved as shown in Fig. B29. The layshaft sliding gear is returned to its neutral position, i.e. not in mesh with either low or second gear, but the mainshaft sliding gear is meshed with the mainshaft third gear. Again the quadrant plungers are able to move the camplate either way.

Finally the selection of fourth (top) gear operates the mainshaft selector fork only and moves the mainshaft sliding gear into mesh with the high gear as shown in Fig. B30. This gear carries the gearbox sprocket.

On each illustration the transmission of drive through the shafts and gears is represented by a red line.

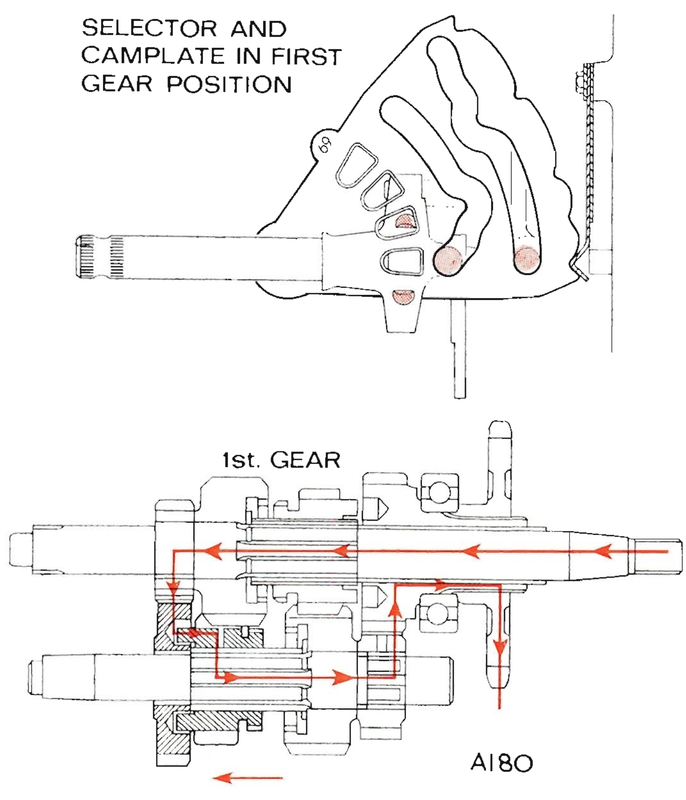


Fig. B26. First gear selected

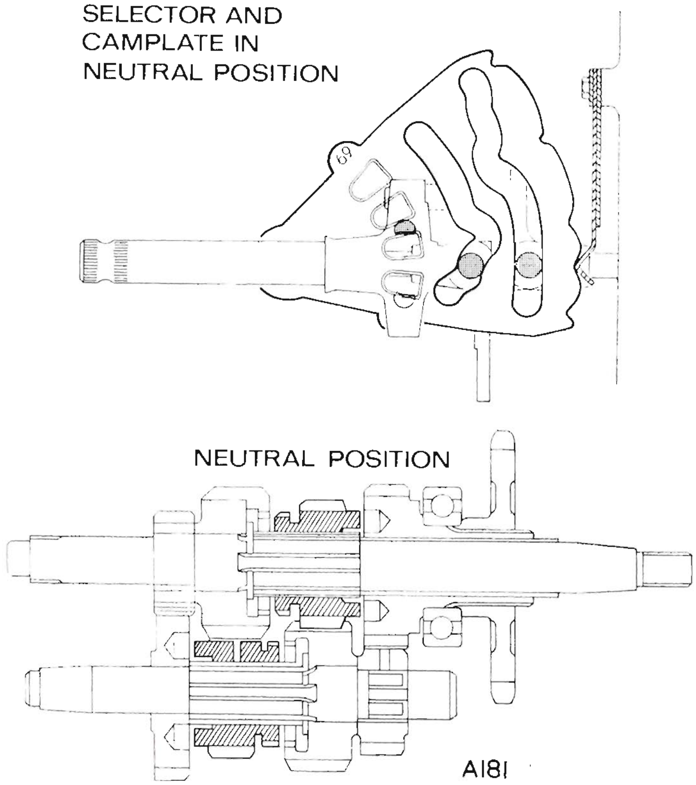


Fig. B27. Neutral selected

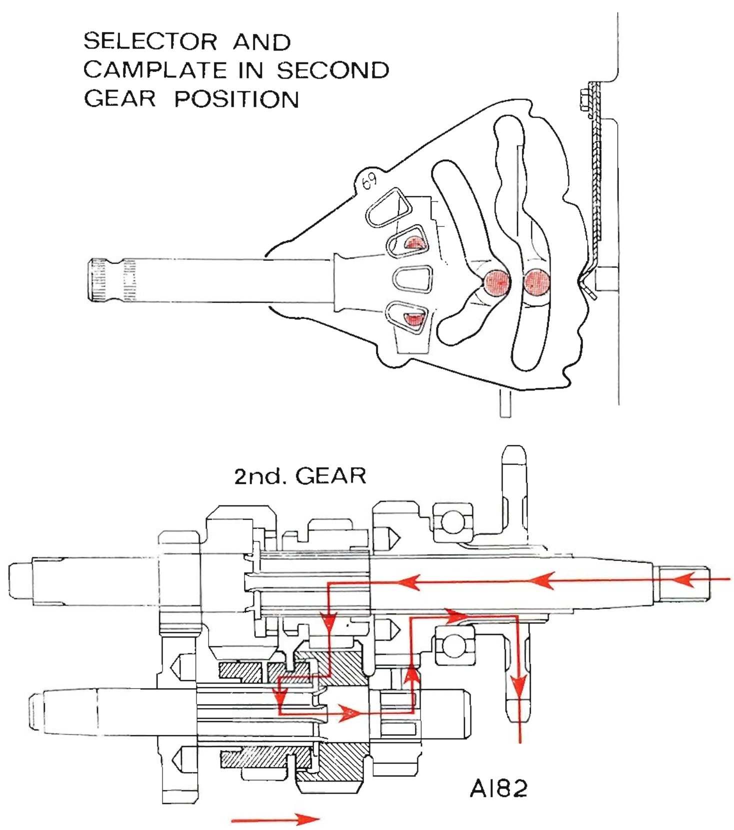


Fig. B28. Second gear selected

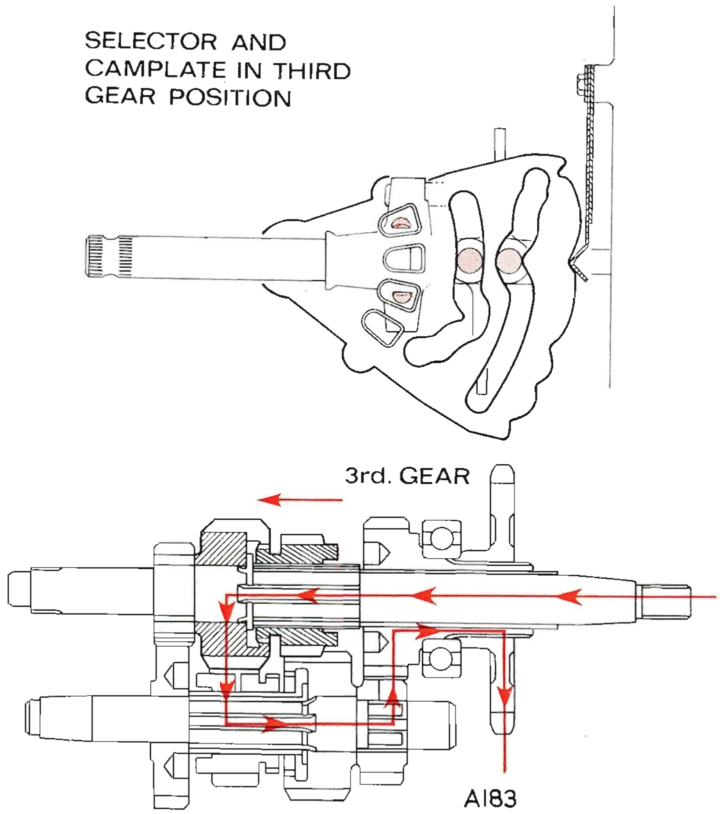


Fig. B29. Third gear selected

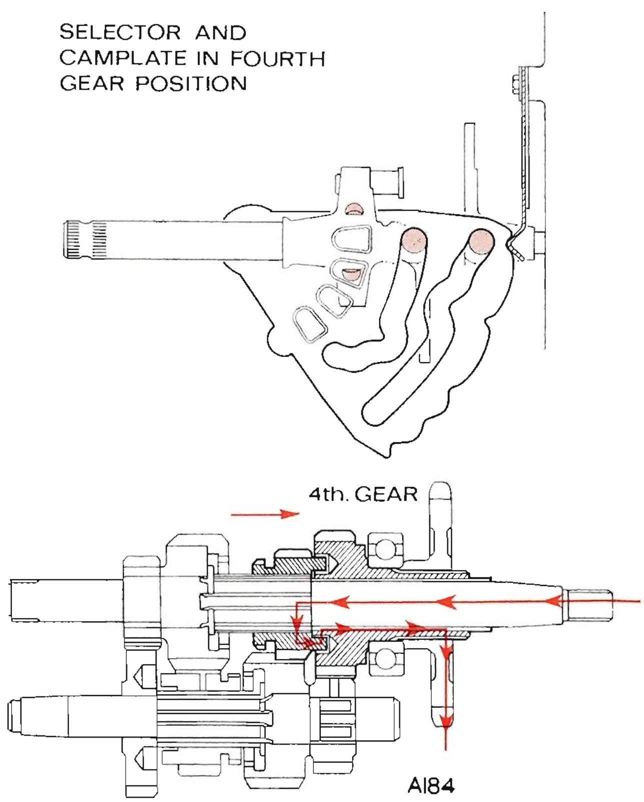


Fig. B30. Fourth (top) gear selected

SECTION B22

DISMANTLING THE GEARBOX

GEARCHANGE MECHANISM

First remove the timing covers, as detailed in Section B18.

Press in the cam plate 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.

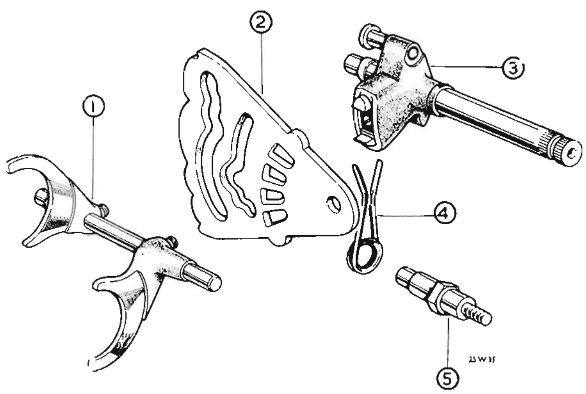


Fig. B31. Gearchange mechanism

Take out the large split pin from the outside of the cover and withdraw the camplate pivot pin. This job will be simplified if a suitable bolt is screwed into the pin enabling the pin to be extracted with pliers (see Fig. B32).

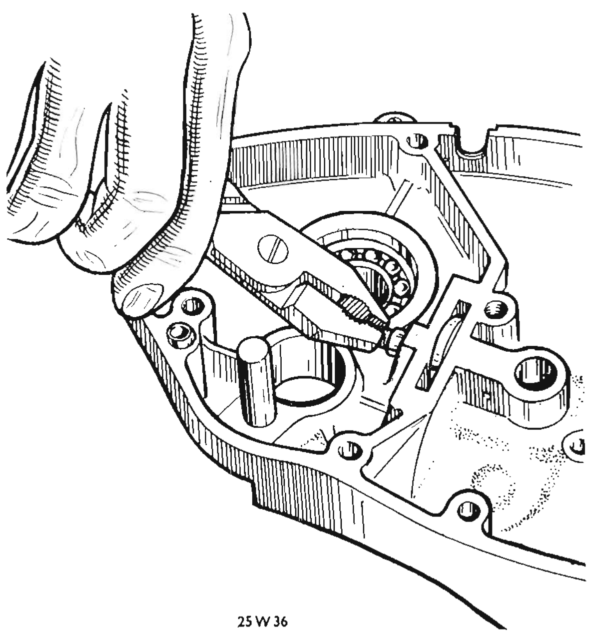


Fig. B32. Removing the cam plate pivot pin

The camplate can now be withdrawn from its slot, complete with selector forks and spindle, the layshaft with fixed top gear, second gear and sliding gear (third), and the mainshaft sliding gear (second). The large layshaft low gear with its bronze bush can now be removed. Note that the top face of the cam plate is stamped with "69" (see Fig. B34) to ensure correct reassembly.

Check the cam plate for wear in the cam tracks and the plunger "windows".

Also check that the quadrant plungers are not chipped or worn and are quite free in their housings.

The cam plate locating spring plates are secured to the gear-side crankcase half with two small bolts. If they are damaged or no longer retain their tensions, then they must be replaced.

Proceed as detailed above, when it will be seen that only the mainshaft with its third and low gear, remains on the inner timing cover.

To remove the mainshaft, grip it in a vice using soft metal clamps, unscrew the kickstart ratchet nut then take off the special washer, spring, ratchet pinion, sleeve and driving pinion. The gearbox mainshaft can now be withdrawn from the cover bearing, together with its low gear and third gear.

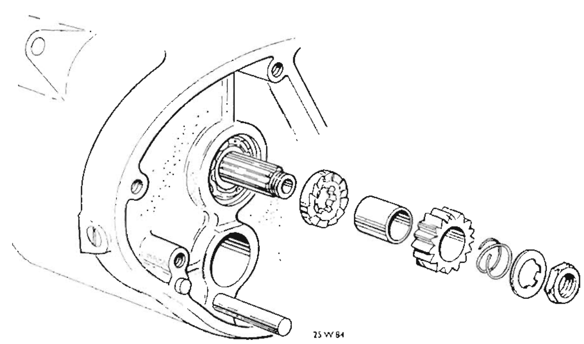


Fig. B33. Kickstart ratchet

The low gear is a press-fit on to the shaft, and retains the larger gear which has a spacer between itself and the end of the splines.

If it is necessary to change either of these gears, the shaft must be pressed out of both gears at the same time, an operation which requires a good press properly mounted on a workbench.

The layshaft second gear is held against the fixed gear (high) by a circlip.

When examining the gears, look for cracked, chipped or scuffed teeth the latter will show (if present) on the thrust faces of the teeth.

GEARBOX BEARINGS

When examining the gearbox bearings and bushes for wear, do not overlook the bronze bushes in the layshaft low gear and the mainshaft high gear. The mainshaft high gear is still in the crankcase at this stage.

The layshaft has needle roller bearings at each end, one in the crankcase and one in the kickstart quadrant boss.

The mainshaft has two ball journal bearings, one at each end. To gain access to the left-hand bearing, first remove the gearbox sprocket (as detailed in Section B14), then drive the high gear sleeve pinion through into the gearbox.

After prising out the oil seal, the bearing can be pressed out from the inside of the cover.

Note. Before attempting to remove any bearing or bush from an aluminium case, the case should first be heated. The bearing can then be pressed out and the replacement fitted whilst the case is still hot.

The right-hand mainshaft bearing can be pressed out from the inside of the inner cover, after first removing the circlip.

GEARBOX REASSEMBLY

Before reassembly, note that if there has been any previous tendency to jump out of second or third gear, the following parts should be fitted as a set:

Part No.	Description	Identification
T3850	Camplate	Stamped 69
T3854	M/S Selector Fork	Has $\frac{7}{16}$in. DIA. BOSS
T3876	M/S Second Gear	Stamped 57
T3877	L/S Third Gear	Stamped 57

Any tendency for the gearbox to jump out of top gear is often caused by the camplate index spring plate being badly positioned. If it has been slackened, the spring often moves towards the mainshaft thus allowing the selector fork to compress it when selecting top gear.

The index spring then pushes the selected fork out of engagement and the gearbox finds the neutral position between third and top gear. To eliminate the problem, slacken both spring retaining bolts and move the spring away from the mainshaft. Retighten the bolts.

It will be assumed that all bearings, bushes and oil seals have been replaced as necessary.

If it has been removed, replace the cam plate, correct way round in the cover slot (see Fig. B34 for

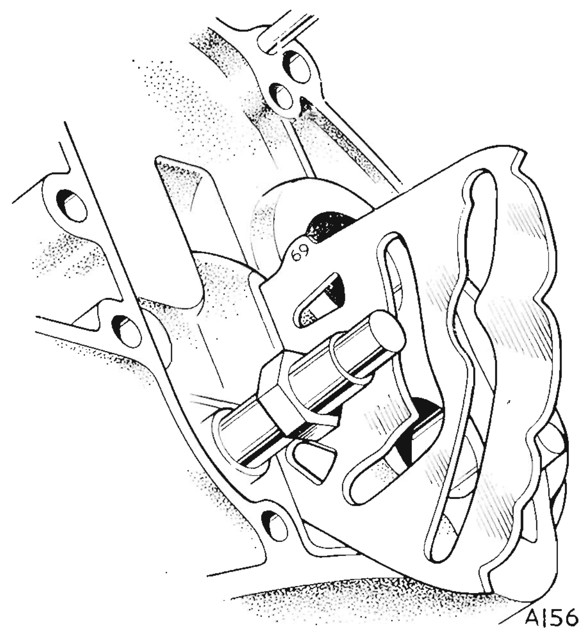


Fig. B34. Showing camplate marking.

guidance), insert the pivot pin and secure with the split pin.

Insert the mainshaft fitted with its low gear and third gear, into the cover bearing, replace the kickstart ratchet assembly and secure with the fixing nut.

It will be necessary to hold the mainshaft in a vice, using soft metal clamps, to tighten the nut fully.

Holding the cover face down, place the layshaft low gear with its shim (C) Fig. B35, and sliding gear (third) in position on the cover. Fit its selector fork, the roller being located in the lower cam plate track.

Next fit the mainshaft sliding gear (second) with the appropriate spacers. Replace its selector fork and locate the fork roller in the upper cam track. Insert the spindle through the selector fork bosses and locate in the cover.

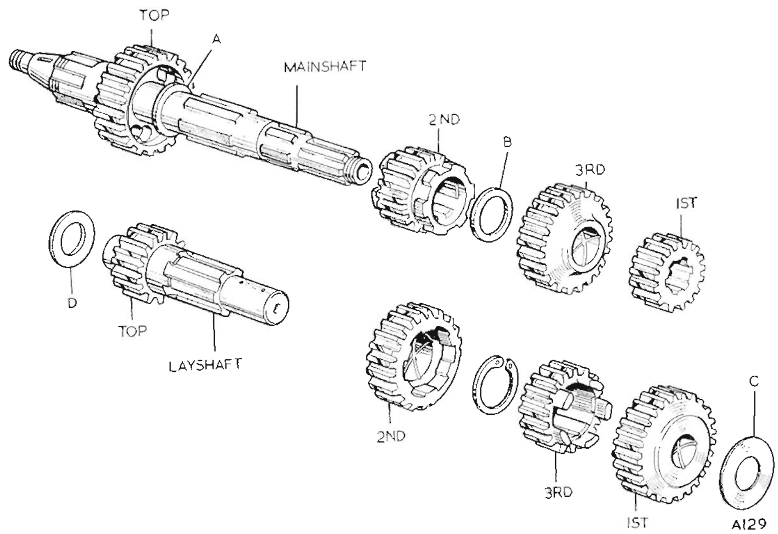


Fig. B35. Gear cluster exploded

The layshaft, with its remaining two gears (fixed high gear and second gear) can now be passed through the gears on the cover, into the kickstart boss needle roller.

Fit the gearchange return spring to the quadrant and replace the assembly in the cover, locating the spring loop over the pivot bolt. It will be necessary, whilst carrying out this operation, to press in the plungers with a suitable flat-bladed instrument, before finally engaging the plungers with the cam plate "windows" as the quadrant pressed home.

A thrust washer (*D*) is fitted to the driveside end of the layshaft when there should be just perceptible end float. The mainshaft, being locked to the inner cover, does not need checking for end float but excessive movement between the gears and the ends of the splines must be corrected by fitting the appropriate spacers. See Fig. B35 for position of each spacer, the thicknesses and part numbers of which are as follows:—

A. .093/.094 in. (T2678);
.098/.099 in. (T2679);
.103/.104 in. (T2680).

B. .070/.071 in. (T2665);
.075/.076 in. (T2664)
.080/.081 in. (T2666).

C. Standard shim (T2670).

D. .078/.080 in. (T2672);
.083/.085 in. (T2671)

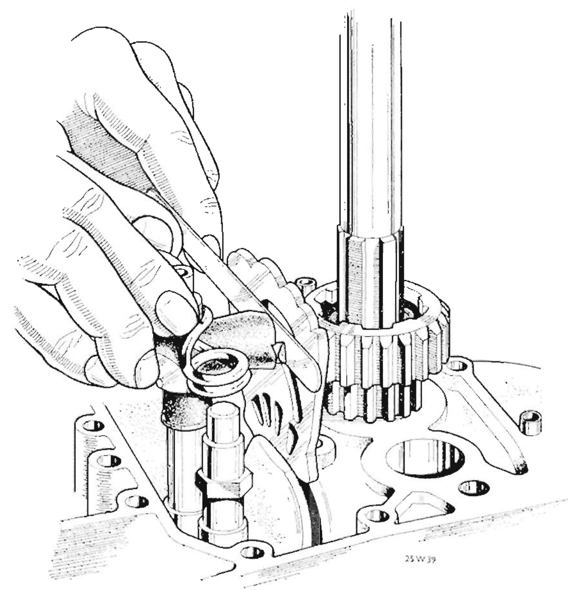


Fig. B36. Fitting the gearchange quadrant

SECTION B23

SPLITTING THE CRANKCASE HALVES

Before attempting to part the crankcase halves, first remove the primary drive assembly, timing covers and timing gear as described on previous pages.

Working on the primary side of the crankcase, first remove the three bolts at the lower front of the case then take off the four stud nuts; two from the centre of the case and two from the cylinder base.

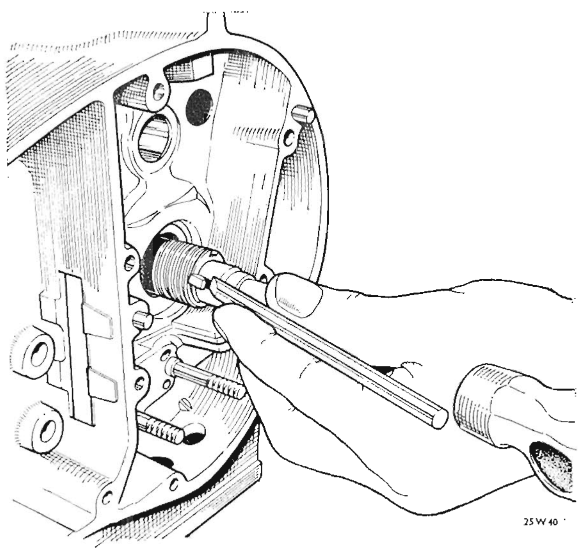


Fig. B37. Removing a Woodruff key

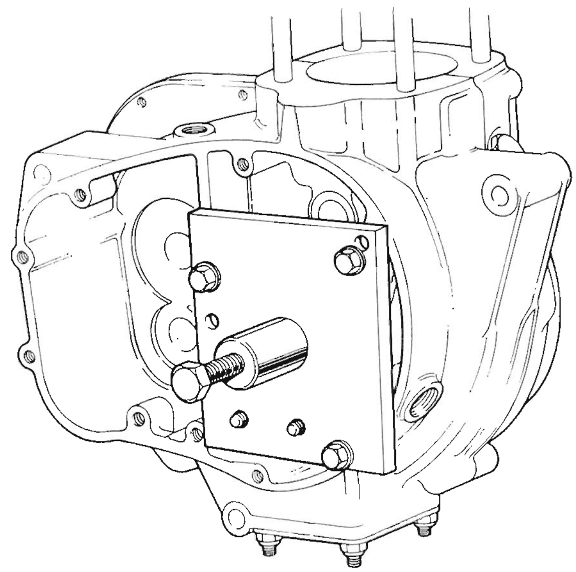


Fig. B38. Splitting the crankcase using Service Tool Z165

The sump filter and the oil pipe union may be left on the crankcase unless they require cleaning or replacement.

Remove any Woodruff keys which may still be in the shafts, noting their particular locations.

Remove the hollow dowel from the upper right of the timing side joint face and position service tool as shown above (Fig. 61-6045).

SECTION B24

CRANKSHAFT AND BIG-END

Removal of the connecting rod from the crankshaft is quite straightforward but, to assist in correct reassembly, it is recommended that the rod and its cap are marked to ensure replacement in the same position. Using a suitable tube spanner, unscrew the cap retaining nuts alternately a turn at a time to avoid distortion, then withdraw the cap and connecting rod.

When extracting the bearing shells, note that they are each located by means of a small tag.

If the shells appear to have worn considerably or are badly scored, then it will be necessary to regrind the crankshaft journal for use with undersize shells, as indicated in the chart overleaf.

Note. Replacement bearing shells are prefinished to give the correct diametrical clearance on a suitably reground journal. On no account should the shells be scraped or the connecting rod and cap joint faces be filed.

Before regrinding, remove the flywheels. Four special bolts, of two different sizes, secure each flywheel to the crankshaft webs. Note that the right-hand flywheel contains an oil sludge trap and is fitted with a screwed plug. Degrease the threads of the bolts and the mating surfaces of the crank and flywheel with cellulose (lacquer) thinners and apply "Loctite" to these areas prior to reassembly. If at all possible, warm the whole assembly to approximately 300°F. to set the "Loctite". This will prevent effectively any loss of oil pressure around the crank.

After regrinding, the appropriate undersize must be clearly marked on the outer face of each crankshaft web. It is most important that the radii at the inner faces of the crank journal remain at ·070/·080 in.

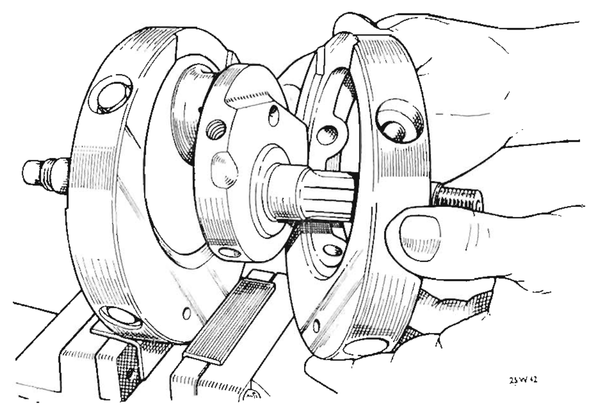


Fig. B39. Removing a flywheel

	Bearing Shell Marking	Suitable Crankshaft Journal Size	
	Standard	1·4375 in. 1·4380 in.	36·5125 mm. 36·5252 mm.
First regrind	—·010 in.	1·4275 in. 1·4280 in.	36·2585 mm. 36·2712 mm.
Second regrind	—·020 in.	1·4175 in. 1·4180 in.	36·0045 mm. 36·0172 mm.
Third regrind	—·030 in.	1·4075 in. 1·4080 in.	35·7505 mm. 35·7632 mm.

SECTION B25

FLYWHEEL BALANCING

If the flywheels have been removed and refitted, the assembly should then be re-balanced. Flywheel balancing is a skilled operation and should not be undertaken by anyone other than an expert mechanic having access to the necessary equipment. A drilling machine with depth stop is required. Balancing must be carried out on a set of knife edge rollers, the rollers of which must be set perfectly horizontal.

To ensure accurate balancing, a weight (part No. 61–6124) must be attached to the crankshaft journal.

Place the crankshaft centrally on to the rollers and revolve a few times. Allow the assembly to come to rest then mark the lowest point on the flywheels with chalk. This will indicate the heaviest part of the assembly.

The next step is to find the amount of out-of-balance so, plasticine is applied to the rim of each flywheel diametrically opposite the heaviest point (marked with chalk), until the assembly remains stationary when placed in any position on the rollers.

The wheels must now be drilled at the heaviest point to remove metal equivalent in weight to that of the plasticine.

Drilling should be confined to the thicker portion of each flywheel, opposite the balance weight, and must be carried out equally on the periphery of **both** wheels. The holes must not be deeper than $\frac{3}{8}$ in. or be more than $\frac{3}{8}$ in. in diameter. Obviously, it is wiser to start with a smaller diameter hole which can be opened out if necessary, than to start with a large hole and find that too much metal has been removed.

Finally, thoroughly wash the assembly in paraffin and check that the oil-ways are free from blockage.

SECTION B26

REFITTING THE CONNECTING ROD

The need for cleanliness cannot be overemphasized and, as the various parts are assembled, all bearing surfaces should be coated with clean engine oil and new self-locking nuts used.

Place the new bearing shells in both the connecting rod and cap, making sure they are seated correctly. Fit the rod to the crankshaft journal and replace the end cap. After checking that the marks on the rod and cap correspond and that the rod is the right way round, insert the bolts and tighten the new self-locking nuts to a torque setting of 25/27 lb./ft.

Using a pressure oil can, force clean oil through the drilling, at the right-hand end of the crankshaft until it is seen to issue from around the big-end bearing, thus indicating that the oil-ways are not blocked and are full of oil.

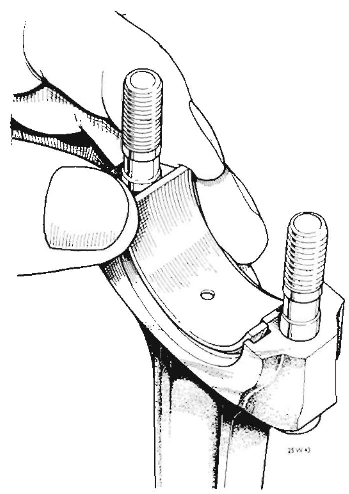


Fig. B40. Fitting a bearing shell

SECTION B27

RENEWING THE MAIN BEARINGS

The left side crankcase oil seal can be removed by drifting it out of the case from the inside after the crankshaft has been removed. It is advisable to renew the oil seal even if it does not appear badly worn. To remove the timing side ball journal bearing heat the crankcase to approximately 100°C and drive the bearing from the outside of the case using a drift.

At this stage inspect the left side roller bearing whilst the outer race is still retained in the crankcase and the inner race on the crankshaft. Check the rollers and the outer race for signs of pitting or score marks and if suspect replace the complete bearing. Remove the inner race of the roller bearing using service tool No. D3677. (See Section J, Fig. J17).

Check the right side main bearing for excessive play of the inner race and also inspect for pitting and roughness of the bearing surface. It is advisable to renew both the main bearings even if only one of them displays prominent signs of wear or damage.

To assemble the new bearings first ensure that the bearing housing is clean and then heat the crankcase to approximately 100°C and then drift in the bearing on the outer race, using a press where possible. When the left side bearing is assembled press the oil seal into position.

SECTION B28

REASSEMBLING THE CRANKCASE

Place the crankshaft assembly into the drive-side case. This operation will be simplified if the case is supported on a large block of wood, deep enough to keep the end of the shaft clear of the workbench.

Apply a thin coating of jointing compound to the joint faces of each crankcase half and fit the gearside case. Replace the three bolts at the front of the case and the four nuts (two at the base of the cylinder and two in the primary case).

Tighten bolts and nuts evenly, to avoid distorting the joint faces. (Alternatively, reassembly may be carried out with service tool Z167 as shown in Fig. B42.)

Check that the crankshaft assembly rotates quite freely. If it does not, then the alignment may be incorrect and the cause of the trouble must be rectified.

Fit the crankshaft sprocket distance piece and the oil pump worm drive thrust washer, each with its chamfered face outwards. The sprocket distance piece is available in three thicknesses to provide accurate alignment of the primary chain in relation to the clutch sprocket. The sizes are as follows:—

·294/·297 in.; ·309/·312 in.; ·324/·327 in.

Reassembly from this point is described in the previous sections. Do not omit to replace the keys in the ends of the shafts before fitting the pinions or sprockets.

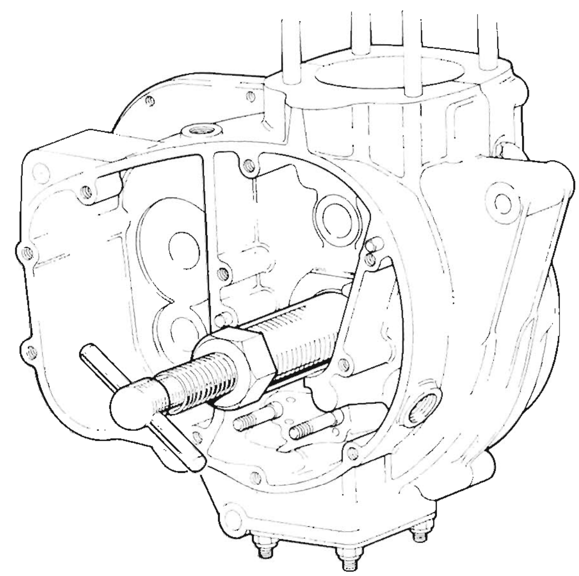


Fig. B42. Reassembling crankcases using Service Tool No. Z167

SECTION B29

IGNITION TIMING

Before carrying out any check on the ignition timing, the contact points gap should first be checked and, if necessary, re-adjusted as described in Section B17.

Remove the sparking plug to enable the engine to be rotated without any resistance due to compression. If the engine is in the frame, it will also help if top gear is selected, so that the engine may be turned either backwards or forwards by rotating the rear wheel.

Before checking the ignition timing, the piston must first be set at the recommended position before top dead centre on its compression stroke (both valves closed)—see General Data.

Remove the small inspection cover at the forward end of the primary drive case to expose the generator rotor. It will be seen that there are two timing marks scribed on to the face of the rotor and that a pointer is mounted at the base of the inspection aperture (as shown in Fig. B43).

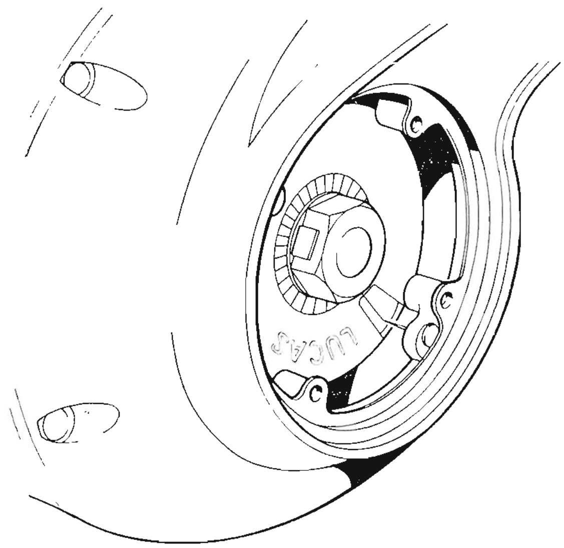


Fig. B43. Showing rotor marking

Rotate the engine slowly until the pointer coincides with the timing mark furthest away from the keyway or the mark nearest the word "LUCAS".

At this stage the auto-advance unit should be freed from its taper by removing the centre bolt and screwing in extractor 61-3816 until the auto-advance cam is released from its taper. The auto-advance unit should be rotated until the contact points are about to open whereupon the bolt should be refitted to pull the auto-advance cam back onto the taper.

This will give an approximate setting on which to base the final ignition timing.

SETTING THE CONTACT BREAKER CAM

The simplest way to set the ignition timing, is to set it statically.

Unfortunately, due to manufacturing tolerances this is not the ideal because, whilst it will set the timing of the engine for tick-over speeds, the firing at wide throttle openings will vary due to differences in the amount of automatic-advance.

The automatic-advance functions by centrifugal force acting on spring-loaded bob-weights which will advance the ignition timing as the engine revolutions rise. Since exact timing accuracy is required at operating speeds it is better to time the engine in the fully advanced position so transferring any variations in the firing to the tick-over or low engine speeds when it can least affect the performance.

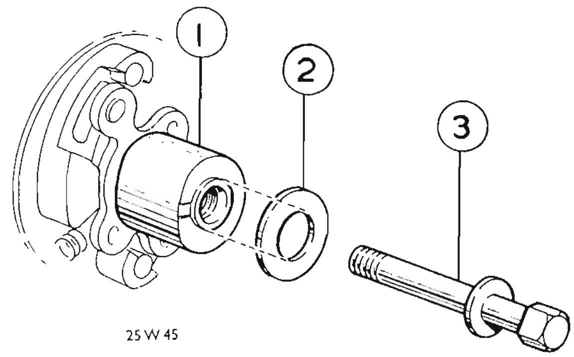


Fig. B44. Setting the contact breaker cam

Whilst setting the ignition timing, therefore, the contact breaker cam must be locked in the fully advanced position.

Carefully remove the central fixing bolt (3) with washer from the contact breaker cam (1) and temporarily fit another washer (2) having a hole just large enough to clear the cam inner bearing (see Fig. B44), thus allowing the washer to bear against the top face of the cam.

Replace the bolt, but before tightening, rotate the cam in an anti-clockwise direction until the bob-weights are fully expanded, hold in position and tighten the bolt. Care must be taken during this operation to avoid releasing the whole mechanism from its location.

ALTERNATIVE METHOD

Machines have a plug screwed into the top front of the left crankcase forward of the cylinder barrel. Remove this plug and, with the engine at top dead centre (piston at top of stroke and both valves closed) fit the timing plunger and body (61–2915 and D572). Turn the engine backwards gently (by

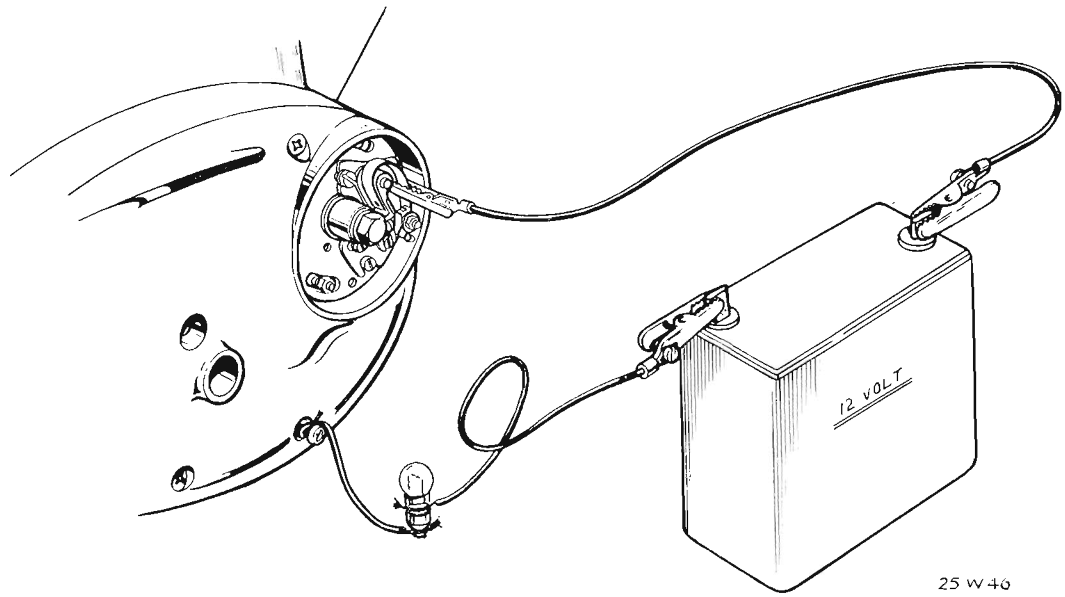


Fig. B45. Battery and bulb in circuit

turning the rear wheel) and with slight hand pressure on the plunger, this should locate in the hole provided in the left flywheel. Set the auto-advance cam in the fully advanced position as previously described. The ingition timing can then be set as follows.

SETTING THE IGNITION TIMING

Having locked the contact breaker cam in the fully advanced position and with the rotor timing mark set at the pointer, the ignition timing can now be set.

An accurate means of checking the opening of the contact points can be made by connecting a battery and bulb in circuit with the points (see Fig. B45).

Attach one lead between the "C" spring and the battery terminal. Take a second lead from the other battery terminal to a bulb, then from the base of the bulb to a good earthing point on the machine.

As soon as the contact points open, the circuit will be broken and the light will go out.

Loosen the contact breaker plate pillar bolts and rotate the plate either clockwise or anti-clockwise until the points are just opening.

Use the contact breaker plate adjustment to obtain as accurate setting as is possible. Then tighten the pillar bolts and finally set the ignition timing by using the range offered by the secondary backplate. This is achieved by loosening the secondary bracket locking screws (see section B17 Fig. B17) and adjusting the eccentric screw. This will enable an accurate ignition setting to be obtained.

Hold the plate in this position, tighten the pillar bolts and re-check the setting. There should be no change in the fully-open gap setting.

Do not forget to remove the large washer, fitted temporarily behind the contact breaker fixing bolt, otherwise the auto-advance mechanism will be inoperative.

The importance of accurate ignition timing cannot be over emphasized. Care and patience must be taken to ensure that the final setting is in accordance with the recommended figures.

Many dealers possess stroboscopic equipment designed for setting the ingition timing of engines accurately, and if any difficulty is experienced in obtaining the correct setting as detailed above, advantage should be taken of this service.

CHECKING THE IGNITION TIMING WITH A STROBOSCOPE

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

To proceed, remove the inspection cover at the front of the primary drive case expose the generator rotor and ignition pointer, as shown in Fig. B43.

Connect the strobelight to a suitable 6 or 12 volt 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 appropriate mark on the rotor will line-up when the engine exceeds 3,000 revs per minute.

Correct any variation by adjusting the contact breaker plate as detailed in the previous section.

SECTION B30

FITTING A TACHOMETER

Parts are available through normal spares supply channels for the fitting of tachometer. There is a blanking plate on the front of the right crankcase retained by two screws and this should be removed. It is necessary to lift the forward end of the engine in the frame to allow sufficient room to insert the drive housing. Detach the exhaust system, fuel tank and cylinder head steady, remove the front and permit this. The drive housing complete with gear and shaft can then be slid in, being tapped home gently with a hammer until the securing flange is flush with the crankcase.

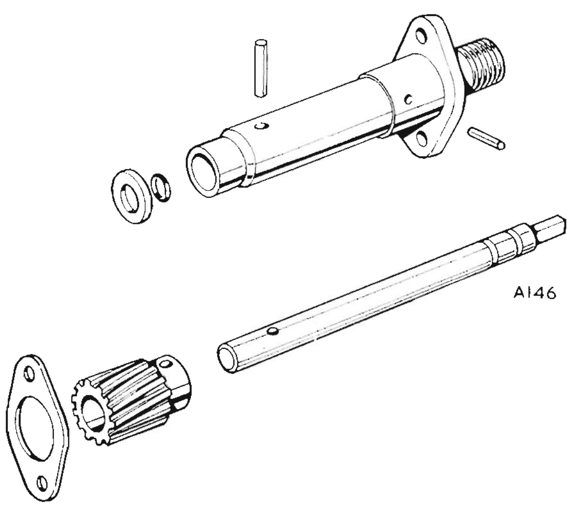


Fig. B46. Showing order of assembly of tachometer drive

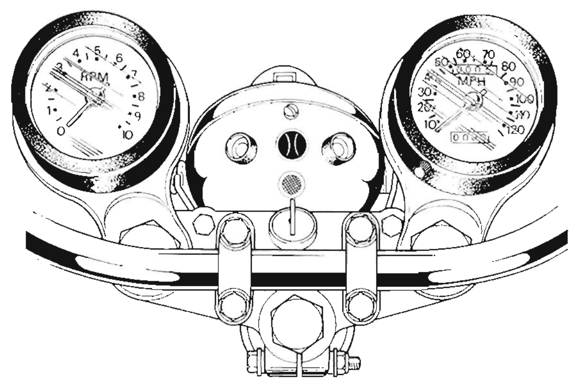


Fig. B47. Speedometer and Tachometer assembled

The drive gear meshes with the oil pump drive gears. If for any reason the drive gear and shaft need to be separated from the housing note that there is a driven in peg at the outboard end which will first have to be removed.

A rev counter mounting plate must be obtained and fitted in the same manner as the speedometer.

SECTION C

CARBURETTER

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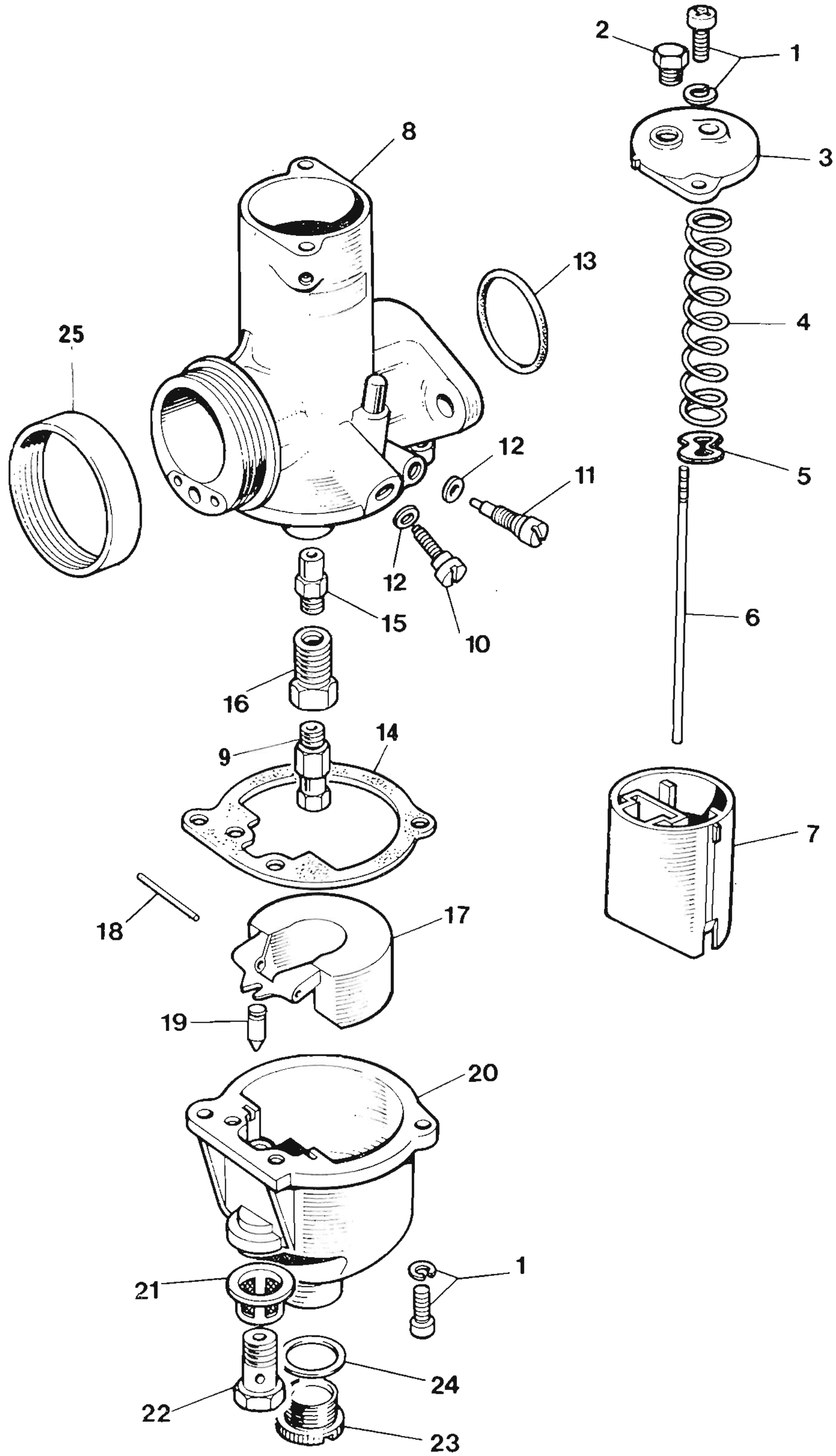

1. FIXING SCREWS
2. ABUTMENT
3. TOP
4. THROTTLE SPRING
5. NEEDLE CLIP
6. JET NEEDLE
7. THROTTLE SLIDE
8. MIXTURE CHAMBER
9. MAIN JET
10. THROTTLE STOP
11. AIR SCREW
12. WASHERS
13. 'O' RING
14. BOWL GASKET
15. NEEDLE JET
16. MAIN JET HOLDER
17. FLOAT
18. FLOAT HINGE
19. FLOAT NEEDLE
20. BOWL
21. FILTER
22. BANJO BOLT
23. BOWL PLUG
24. SEALING WASHER

Fig. C1. Exploded view of carburetter

DESCRIPTION

The machine is fitted with an Amal carburettor, incorporating a concentric float chamber.

The carburetter, because of its jets and choke bore, proportions and atomises just the right amount of petrol and air which provides a highly inflammable mixture. The mixture is drawn into the engine and burnt within the cylinder head and piston crown, hence the term "combustion chamber."

The float chamber maintains a constant level of fuel at the jets and incorporates a valve which cuts off the supply when the engine stops.

The throttle, being operated from the handlebar twist grip, controls the volume of mixture and therefore the power.

When the engine is ticking-over, the mixture is supplied through a pilot jet. As the throttle is opened, the pilot mixture is augmented (via the pilot by-pass), by the supply from the main jet; the initial stages being controlled by the taper needle in the needle jet.

The pilot fuel supply is controlled by a small, pressed in jet situated within the carburetter body. The jet is not removable.

The main jet does not spray directly into the mixing chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol/air mixture into the main air chamber. The primary air chamber has a compensating action in conjunction with bleed holes in the needle jet, which serves the double purpose of compensating the mixture from the needle jet and allowing the fuel to provide a well outside and around the needle jet, which is available for snap acceleration.

SECTION C1

STRIPPING AND REASSEMBLING THE CARBURETTER

Disconnect the air filter and release the two fixing nuts. Withdraw the carburetter from its mounting studs; it will not be necessary to detach the cable from the twist grip.

Take out the two Phillips-head fixing screws and remove the carburetter top cover complete with throttle slide assembly. Compress the throttle spring and remove the needle clip to release the needle. Whilst still compressing the spring, push the cable downwards to release the nipple from its location in the valve. Take care not to lose the needle clip when taking off the spring and top cover.

Unscrew the "banjo" bolt which secures the fuel pipe "banjo" connector to the float needle seating block and withdraw the nylon filter.

The float chamber is secured to the base of the mixing chamber by two screws with spring washers. On removal, it will be noted that the float spindle is a press-fit into the chamber body and that the float needle is retained in position by the rear forked end of the float.

The needle jet and main jet (with holder) can now be unscrewed from the mixing chamber base.

Take out the throttle stop adjusting and pilot air adjusting screws and ensure that the small rubber "O" ring on each screw is in good condition before replacing.

The float chamber tickler consists of a spring and plunger, splayed at one end to retain it in the mixing chamber. This item should not be subjected to a great deal of wear and is therefore unlikely to require replacement.

Having dismantled the carburetter, carefully clean all parts in petrol (gasolene). Hard deposits on the carburetter body are best removed with a light grade wire brush. After washing the parts in clean petrol (gasoline) allow to dry and ensure that all holes or small drillings are free from dirt. A hand pump is ideal for "blowing through" any blockages in the drillings. Inspect the component parts for wear and check that the jets are in accordance with the recommended sizes given in General Data.

Reassembly is simply a reversal of the above instructions but remember to replace any gaskets or "O" rings that appear unserviceable. Refer to Fig. C1 for guidance.

SECTION C2

INSPECTING CARBURETTER COMPONENTS

The parts most liable to show wear after considerable mileage are the throttle valve slide and the mixing chamber.

(1) Inspect the throttle valve slide for excessive scoring of the front area and check the extent of wear on the rear slide face. If wear is apparent, the slide should be renewed; be sure to fit slide with correct degree of cut-away (see General Data).

(2) Check the throttle return springs for efficiency. Check also that it has not lost its compressive strength by measuring the free length and comparing it with the figure given on page GD3.

(3) Examine the needle jet for wear or possible scoring and check the tapered end of the needle for similar signs.

(4) Check the float needle for efficiency by inserting it into the float needle seating block, pouring a small amount of petrol (gasolene) into the aperture surrounding the needle and checking it it for leakage.

(5) Ensure that the float is not punctured by shaking it to see if it contains any fuel. Do not attempt to repair a damaged float. If there is any doubt about its condition, replace it with a new one.

(6) Check the petrol filter that fits over the needle seating block, for any possible damage to the mesh. If the filter has parted from its supporting structure it will allow the petrol (gasolene) to pass through unfiltered.

SECTION C3

HINTS AND TIPS

THROTTLE CABLE

See that there is a minimum of backlash when the twist grip is turned back and that any movement of the handlebar does not cause the throttle to open.

Use the adjuster on the cable to obtain the correct setting and ensure that the throttle slide shuts down freely.

PETROL FEED

Unscrew the float chamber "banjo" bolt, remove the "banjo", and take off the filter gauze from the needle seating.

Ensure that the filter gauze is undamaged and free from all foreign matter. To check fuel flow before replacing the "banjo", turn on petrol tap momentarily and see that fuel gushes out.

FLOODING

This may be due to a worn needle or a punctured float, but is more likely due to impurities (grit, fluff, etc.) in the tank. This trouble can sometimes be cleared by periodically cleaning out the float chamber. If however, the trouble persists, the tank must be drained and swilled out.

CARBURETTER AIR LEAKS

Erratic slow-running is often caused by air leaks between the joints at the carburetter flange and the cylinder head and can be detected by applying oil around the joints. Eliminate by fitting new washers and tightening the flange nuts evenly to the torque wrench setting given in General Data.

Also check that the rubber sealing ring in the carburetter flange is undamaged and located correctly.

On high mileage machines look for air leaks caused by a worn throttle or a worn inlet valve guide.

BANGING, IN EXHAUST

This may be caused by too weak a pilot mixture when the throttle is closed or nearly closed. It may also be caused by too rich a pilot mixture and an air leak in the exhaust system. The reason in either case is that the mixture has not fired in the cylinder but has fired in the hot silencer.

If the banging occurs when the throttle is fairly wide open, the trouble will be traced to ignition, not carburation.

EXCESSIVE PETROL CONSUMPTION

If this cannot be corrected by normal adjustments, it may be due to flooding caused by impurities from the petrol tank lodging on the float needle seat, so preventing its valve from closing. The float needle should also be checked for wear or damage.

High consumption can also be caused by a worn needle jet and may be remedied or improved by lowering the needle in the throttle. If this method is unsatisfactory, then a new needle and needle jet will have to be fitted.

There are many other causes of high petrol consumption and it should not be assumed that the fault lies in the carburetter alone.

AIR FILTERS

If a carburetter is first set with an air filter and the engine is then run without, the jet setting may be affected and care must be taken to avoid overheating the engine due to too weak a mixture. Testing with the air supply will indicate if a larger main jet and higher needle position are required.

EFFECT OF ALTITUDE ON A CARBURETTER

Increased altitude tends to produce a rich mixture; the greater the altitude, the smaller the main jet required. Carburetters ex-works are suitably set for use in altitudes of up to approximately 3,000 feet. Carburetters used constantly in altitudes of between 3,000 to 6,000 feet should have a reduction in main jet size of 5%. A further reduction of 4% should be made for every 3,000 feet in excess of 6,000 feet altitude.

SECTION C4

TRACING FAULTS

Faults likely to occur in carburation can be placed in one of two categories; either richness or weakness of petrol/air mixture.

INDICATIONS OF RICHNESS

Black smoke in exhaust.
Petrol spraying out of carburetter.
Eight-stroking.
Heavy lumpy running.
Sparking plug sooty.

INDICATIONS OF WEAKNESS

Spitting back in carburetter.
Erratic slow-running.
Overheating.
Engine goes better if throttle is almost closed.

Having established whether the mixture is too rich or too weak, check if caused by:—

(1) Petrol feed—check that jets and passages are clear, that filter gauze in float chamber "banjo" connection is not choked with foreign matter, and that there is ample flow of fuel. Also ensure there is no flooding.

(2) Air leaks—usually at the flange joint or due to worn inlet valve stem and guide.

(3) Defective or worn parts—such as a loose-fitting throttle valve, worn needle jet, loose jets.

(4) Air cleaner choked-up.

(5) An air cleaner having been removed.

(6) Removal of the silencer—this requires a richer setting.

Having ensured that the fuel feed is correct and that there is no air leak etc., check the ignition, valve operation and timing. Test to see if the mixture is rich or weak by partially covering the carburetter inlet and noting how the engine runs. If the engine runs better, weakness is indicated, but if the engine runs worse then the mixture is too rich.

For suggested remedies see Section C6.

SECTION C5

CARBURETTER ADJUSTMENTS

(A) **Throttle Adjusting Screw**
Set this screw to hold the throttle open sufficiently to keep the engine running when the twist grip is shut off.

(B) **Pilot Air Adjusting Screw**
This screw regulates the strength of the pilot mixture for "idling" and for the initial opening of the throttle. The screw controls the depression on the pilot mixture chamber by metering the amount of air that mixes with the petrol.

(C) **Main Jet**
The main jet controls the petrol supply when the throttle is more than three-quarters open, but at smaller throttle openings although the supply of fuel goes through the main jet, the amount is diminished by the metering effect of the needle in the needle jet.

Each jet is calibrated and numbered so that its exact discharge is known and two jets of the same number are alike. Never ream out a jet, get another of the right size. The bigger the number the bigger the jet.

To gain aecess to the main jet remove the plug from the base of the float chamber and unscrew the main jet using a small box spanner.

(D) **Needle and Needle Jet**
The needle is attached to the throttle valve and being tapered either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or at nearly full throttle. The taper needle position in relation to the throttle opening can be set according to the mixture required by fixing it to the throttle valve with the jet needle clip in a certain groove. thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttle openings from quarter to three-quarters open.

(E) **Throttle Valve Cut-away**
The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cut-away is recorded by a number marked on the throttle valve, viz. 900/3½ means throttle valve type 900 with number 3½ cut-away; larger cut-aways, say 4 and 5, give weaker mixtures and 2 a richer mixture.

(F) **Tickler or Primer**
This is a small spring-loaded plunger, in the carburetter body. When pressed down on the float, the needle valve is allowed to open and so "flooding" is achieved. Flooding temporarily enriches the mixture until the level of the petrol subsides to normal.

SECTION C6

CORRECTING MIXTURE

TO CURE RICHNESS

Position 1. Fit smaller main jet.
Position 2. Screw out pilot air adjusting screw.
Position 3. Fit a throttle with a larger cut-away (see paragraph E, Section C5).
Position 4. Lower needle one or two grooves (see paragraph D, Section C5).

TO CURE WEAKNESS

Position 1. Fit larger main jet.
Position 2. Screw pilot air adjusting screw in.
Position 3. Fit a throttle with a smaller cut-away (see paragraph E, Section C5).
Position 4. Raise needle one or two grooves (see paragraph D, Section C5).

(Positions 1, 2, 3 and 4 refer to positions of throttle openings as shown in Fig. C2, Section C7).

Note. It is incorrect to attempt to cure a rich mixture at half-throttle by fitting a smaller jet because the main jet may be correct for power at full throttle. The correct method is to lower the throttle needle.

SECTION C7

TUNING THE CARBURETTER

Read the remarks in Section C5 for each tuning device and get the motor going perfectly on a quiet road with a slight up-gradient so that on test, the engine is pulling under load. Set carburation in the following order:

1st. **Main Jet** with throttle in position 1 (Fig. C2). If at full throttle the engine runs "heavily", the main jet is too large. If, at full throttle, the engine seems to have better power when the throttle is eased off or the carburetter intake is slightly covered, then the main jet is too small.

With the correct size of main jet, the engine at full throttle should run evenly and regularly with maximum power.

If testing for speed work, ensure that the main jet size is sufficient for the mixture to be rich enough to maintain a cool engine. To verify this, examine the sparking plug after taking a fast run, declutching and stopping the engine quickly. If the sparking plug has a cool appearance the mixture is correct; if sooty, the mixture is rich; if, however, there are signs of intense heat, the plug being very white

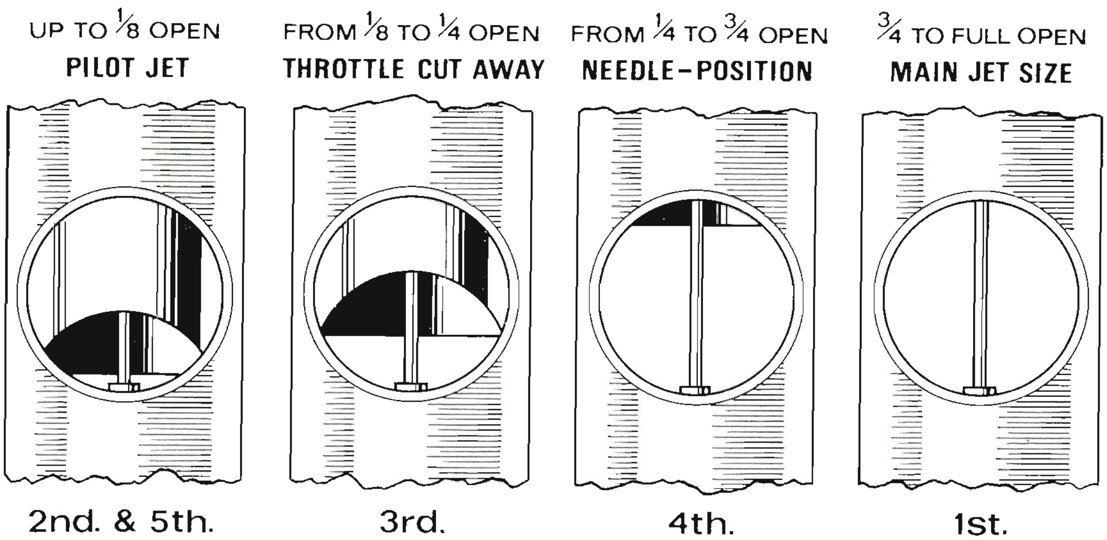

Fig. C2. Sequence of adjustment

in appearance, the mixture is too weak and a larger main jet is necessary.

2nd. **Pilot Mixture** (Fig. C2) with throttle in positions 2 and 5. With the engine idling too fast, the twist grip shut off and the throttle shut down on to the throttle adjusting screw: (1) Screw out the throttle adjusting screw until the engine runs slower and begins to falter, then screw pilot air adjusting screw in or out, to make engine run regularly and faster. (2) Now gently lower the throttle adjusting screw until the engine runs slower and just begins to falter, adjust the pilot air adjusting screw to get best slow-running, if this second adjustment leaves the engine running too fast, go over the job a third time.

3rd. **Throttle Cut-away** with throttle in position 3 (Fig. C2). If, as you take off from the idling position, there is spitting from the carburetter, slightly richen the pilot mixture by screwing in the air screw. If this is not effective, screw it back again, and fit a throttle with a smaller cut-away. If the engine jerks under load at this throttle position and there is no spitting, either the jet needle is much too high or a larger throttle cut-away is required to cure richness.

4th. **Needle** with throttle in position 4 (Fig. C2). The needle controls a wide range of throttle openings and also the acceleration. Try the needle in as low a position as possible, viz. with the clip in a groove as near the top as possible; if acceleration is poor and with the carburetter inlet partially covered, the results are better, raise the needle by two grooves; if very much better try lowering the needle by one groove and leave it where it is best. If mixture is still too rich with clip in groove number 1 nearest the top, the needle jet probably wants replacement because of wear. If the needle itself has had several years' use replace it also.

5th. **Finally,** go over the idling again for final touches.

SECTION D

FRAME

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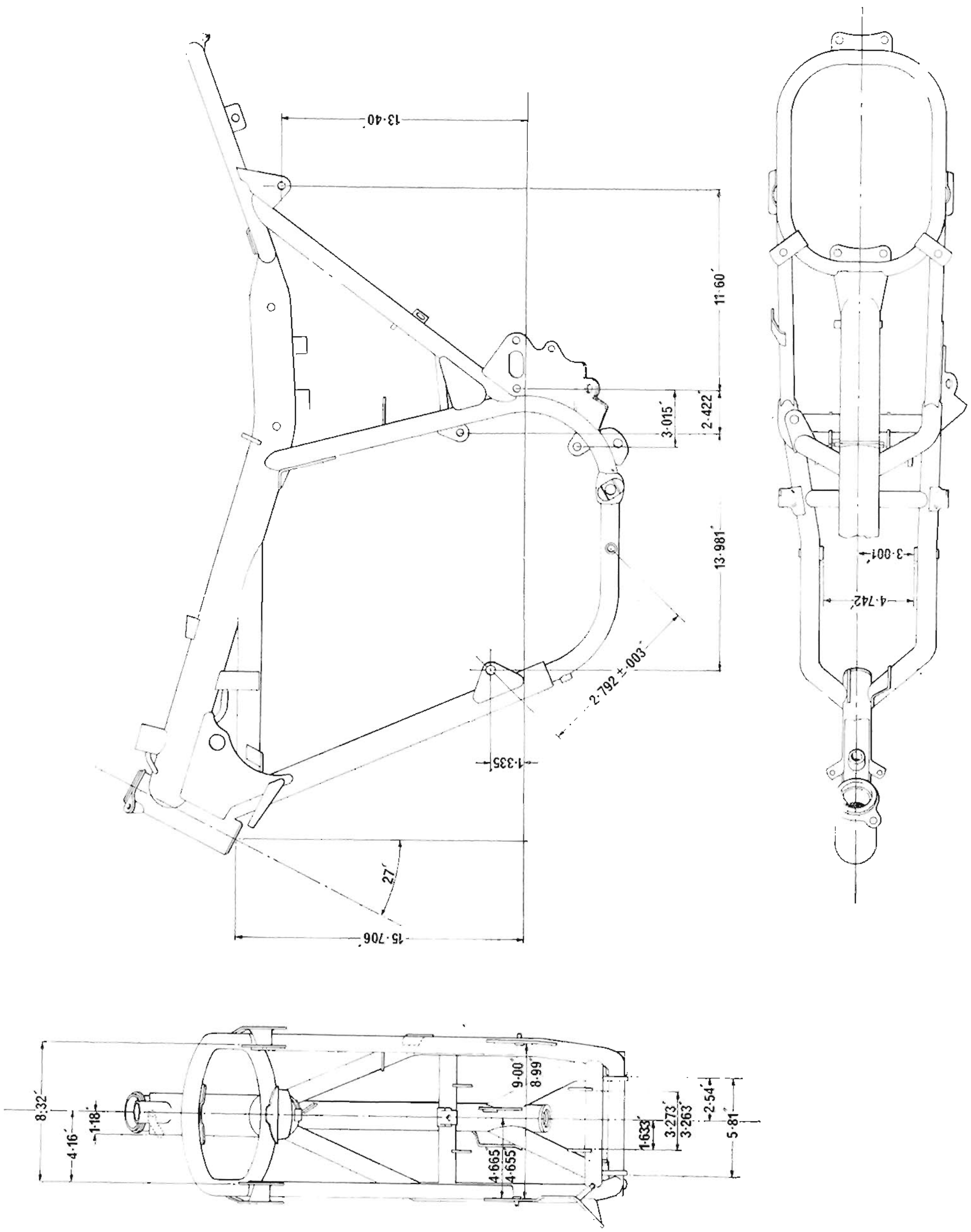


Fig. D1. Frame dimensions

SECTION DI

FRAME ALIGNMENT

The only satisfactory way of checking the frame for correct alignment is on an engineers setting-out table. In addition to the table, which should be approximately 5ft. x 3ft., the following equipment will also be necessary.

- One mandrel See Fig. D2 for dimensions.
- One mandrel or bar for swinging arm pivot $\frac{51}{64}$in. diameter x 12 in. long.
- One large set-square.
- One 18 in. Vernier height gauge or large scribing block.
- One pair of large "V" blocks and several adjustable height jacks.

If a scribing block is used, then an 18 in. steel rule will also be required. The mandrels must be straight and round, otherwise measurements will be affected. Figure D2 shows the basic set-up for checking the frame, though variations can of course be used according to the facilities available.

Place the roller bearings in the steering head, insert the mandrel and support with the "V" blocks at one end of the table. Check the mandrel at each end to ensure that it is parallel with the surface of the table. Insert the $\frac{51}{64}$in. diameter mandrel through the swinging arm pivot hole.

Now, using jacks or packing pieces, set the frame horizontal to the table so that checks taken at points (*A*) are the same.

If the frame has suffered damage in an accident, it may not be possible to set points (*A*) parallel in which case points (*B*) can be used.

Sometimes if the machine has been subjected to a frontal impact, the main tube may remain parallel at points (*A*) but will be arched. A straight-edge made from a piece of good quality hardboard can be used for this purpose, but the checking edge must be quite straight.

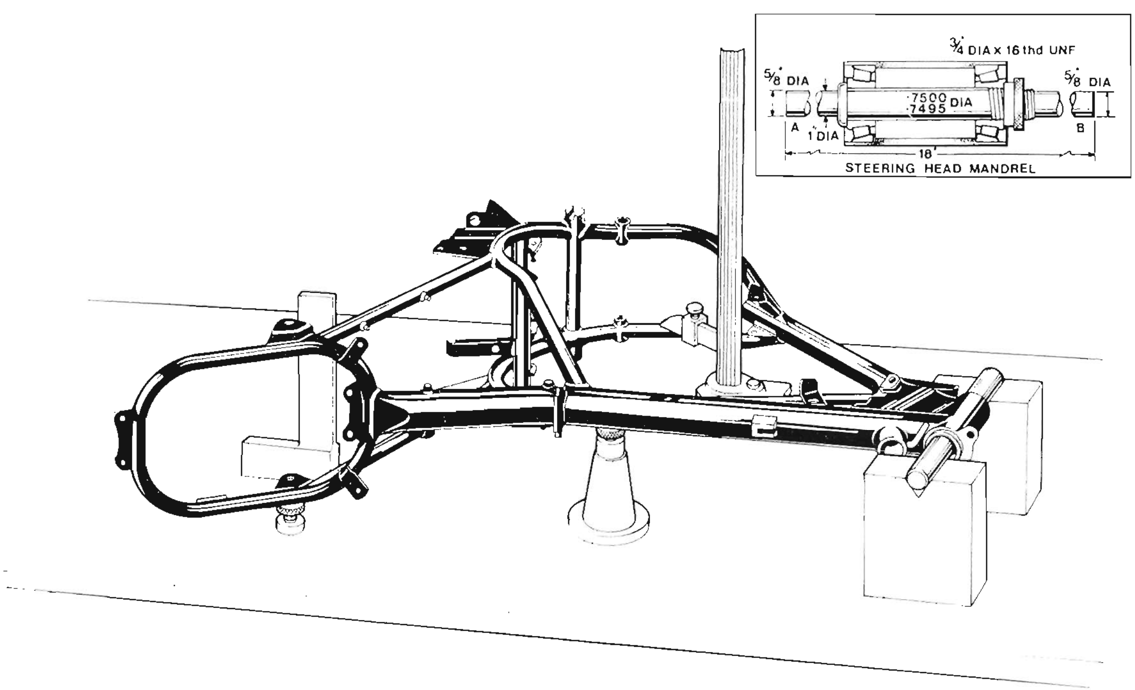


Fig. D2. Showing frame on setting table

When the frame is set parallel to the surface table, the mandrel through the swinging arm pivot holes should be vertical. This can be checked using the set-square and internal calipers or a slip gauge between the mandrel and the square. The set-square should touch both the upper and lower tubes together at points (*C*) and (*D*) if the frame is true and correctly set-up on the table. To find the frame centre line, take the height of the main tube and subtract half the diameter of the tube.

Checks can now be taken at the engine mounting lugs and other points of the frame. Errors at any point should not exceed $\frac{1}{32}$ in. (·79 mm.).

SECTION D2

CHAINGUARD REMOVAL

The chainguard is secured at the front by a bolt passing through a bracket on the swinging arm, and at the rear by the bottom fixing bolt for the suspension unit.

Remove the bolt at the front and loosen the nut at the suspension unit and lift the chainguard away from the machine.

The chainguard extension at the front is fixed to the crankcase by a bolt with one plain and one spring washer beneath the head, and the rear mounting bracket is slotted between the top left engine plate and the frame bracket. After removal of the bolt at the front and loosening of the rear nut the extension can be pulled away.

SECTION D3

REAR SUSPENSION UNITS

The rear shock absorbers, or dampers, are of the coil-spring type, hydraulically damped and are mounted on bonded rubber bushes at each end.

The actual damping unit is a sealed assembly and the only dismantling that can be carried out is for the removal and replacement of the springs.

To remove a damper, take out the top fixing bolt with nut and washers and unscrew the lower fixing self-locking nut at cupped dust cover. Pull the damper off the stud at the bottom and withdraw from the top frame bracket.

If necessary the removal and replacement of the mounting bushes will be found much easier if a little liquid soap is applied.

The damper springs are graded at 100 lb./in. rate.

The damper positions are shown in Fig. D3 and they must be set in the "light load" position before dismantling. A "C" spanner for this adjustment is provided in the toolkit.

To remove the spring grip the bottom lug of the suspension unit in a vice, grasp the spring in both hands and pull down until the spring is sufficiently compressed to allow the spring retainers to be removed by a second operator.

The damper unit should be checked for leakage, bending of the damper rod and damping action.

Reassembly is a reversal of dismantling. Check that the cam is in the light load position before compressing the spring.

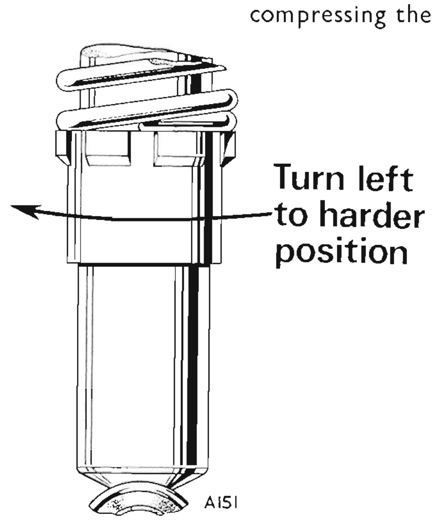
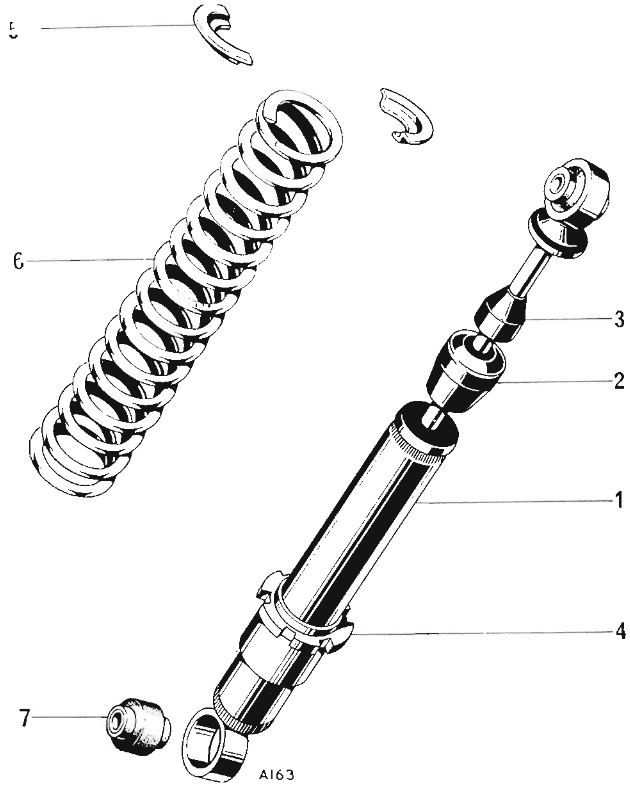
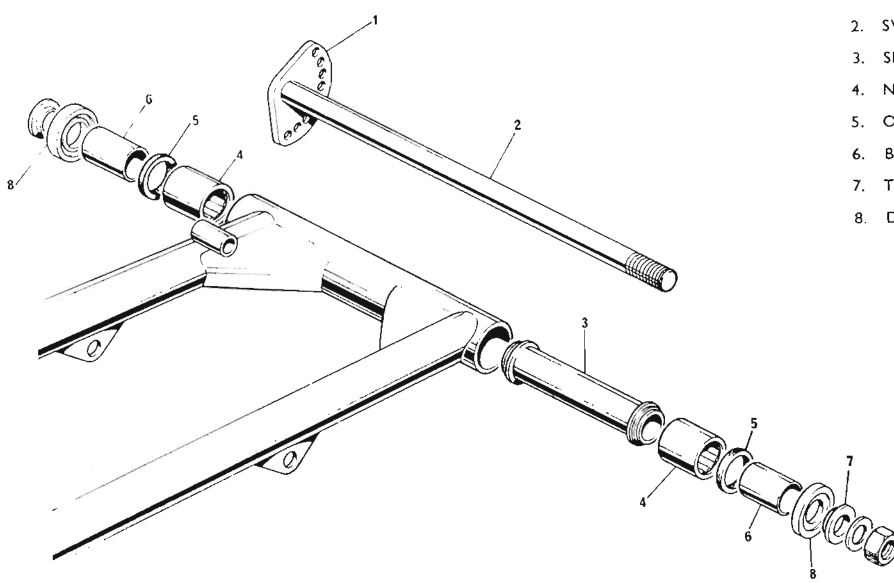


Fig. D3. Cam ring adjustment



1. DAMPER UNIT
2. BUMP STOP
3. ALLOY SPACER
4. ADJUSTER
5. SPLIT COLLAR
6. SPRING
7. BONDED BUSH

Fig. D4. Exploded view of suspension unit



1. ADJUSTER CAM
2. SWING ARM SPINDLE
3. SPACER TUBE
4. NEEDLE ROLLER BEARING
5. OIL SEAL
6. BEARING SLEEVE
7. THRUST WASHER
8. DUST EXCLUDER

Fig. D5. Swinging arm assembly details

SECTION D4

REMOVING THE SWINGING ARM

Take off the rear wheel, chainguard, dampers and rear brake pedal as described in Sections F6, D2, D3, and D9 respectively.

The rear stoplight switch situated behind the rear brake pedal must be allowed to swing clear of the swinging arm cam adjuster. This is achieved by removing the rearmost attachment bolt. Note assembly of spacer and washers for this bolt, (the spring washer sits underneath the head of the bolt). Remove the swinging arm spindle nut from the right side and withdraw the spindle from the left side whilst supporting the swinging arm. Disconnect the snap connectors in the rear harness. They are situated near the left side top suspension unit mounting.

Remove the five bolts securing the mudguard to the frame and remove the mudguard. It will now be possible to withdraw the swinging arm from the frame. Assembly details of the swinging arm bearings, seals and end cups are shown in Fig. D5.

SECTION D5

SWINGING ARM BEARINGS

The swinging arm bearings consist of two precision needle roller bearings that run on ground steel bushes separated by a distance tube. The bearings are lubricated on assembly and have a long serviceable life. However to cope with extremely dirty conditions grease nipples are fitted to later swinging arms and these can be employed to grease the bearings when the necessity arises. (See Section A2 for grease specification).

Under normal conditions the bearings have a long serviceable life. But if the bearings are suspected for wear then they will have to be removed using a suitable drift.

The bearing spacer tube hinders direct application of the drift. But it will be found that the spacer tube can be drifted from one end and out through one needle roller bearing. This will leave the support rings that were previously pressed onto the spacer tube lying loose in the swinging arm housing.

It will now be possible to drift out the needle roller bearings. Make sure that the end of the drift does not have a sharp edge that may dig into the housing. The spacer tube assembly will have to be replaced when renewing the bearings.

When replacing the needle rollers use a suitable drift and ensure that the bearing is square with the housing before using the drift. Replace the new spacer tube assembly from the opposite side and finish with the remaining bearing. Note the assembly of all seals and thrust washers. (See fig. D5 page D5 for details.)

SECTION D6

CHECKING SWINGING ARM ALIGNMENT

Before checking the swinging arm alignment, it must be established that the bearings are in good condition.

Using the same mandrel that was used for the swinging arm pivot on the frame (see page D3), set the swinging arm in "V" blocks as shown in Fig. D6. Another mandrel 12in. long x $\frac{5}{8}$in. diameter should be inserted through the fork ends. Both mandrels should be parallel to the surface table. Should there be less than $\frac{1}{4}$ in. malalignment of the swinging arm fork it is permissible to correct it by means of a suitable lever but, care must be taken to avoid causing further damage.

To check that the forks are square to the pivot, they must be set-up at 90° to the position illustrated, so that the pivot is vertical. Next, find the centre of the pivot and check that the fork ends etc., are in accordance with the dimensions shown in Fig. D7.

When there is considerable malalignment in either frame or swinging arm, it is recommended that a works reconditioned unit is fitted.

Note. There may also be a variation in the rear dampers and a careful examination should be made of the overall length between the mounting eyes. It is possible that one damper may be weaker than the other, caused by the "settling" of a spring. If this should be the case, it is advisable to renew the springs in both dampers.

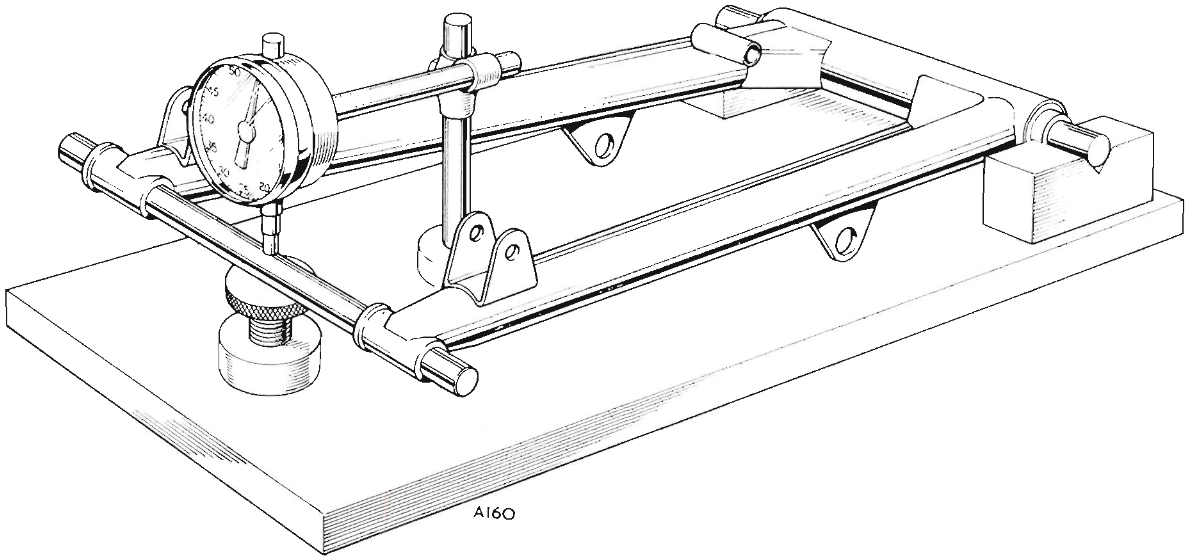


Fig. D6. Checking the swinging arm

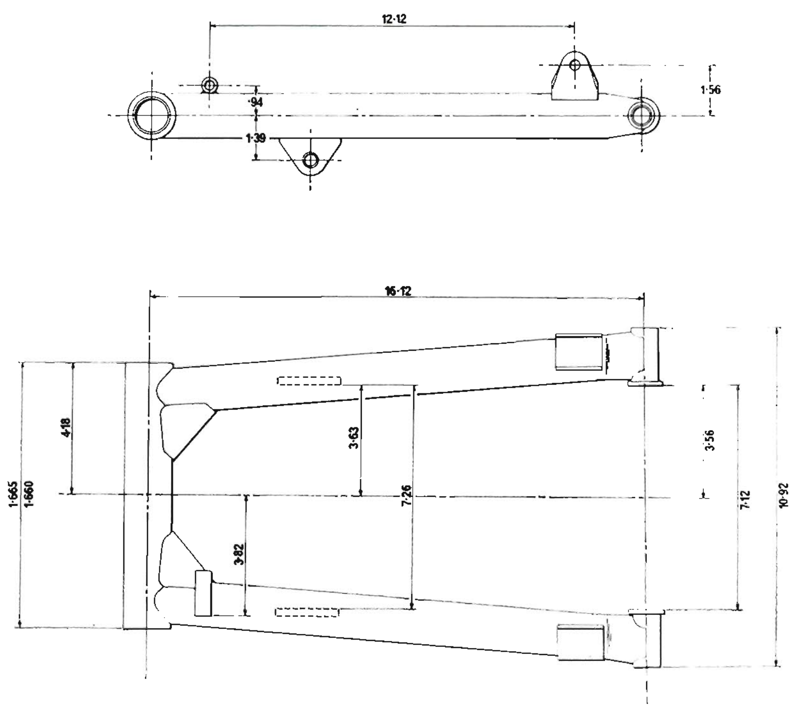


Fig. D7. Swinging arm dimensions (All dimensions are in inches)

SECTION D7

TWIN SEAT

The twin seat is mounted at two points in mid-position and supported in a slotted bracket at the front.

To remove the seat unscrew the two bolts from underneath the seat and slide the seat rearwards and away from the machine.

Replace in the reverse order, making sure that the front fixing is engaged correctly in the slot.

SECTION D8

PROP STAND

With the stand in the raised position remove the "Nyloc" nut from the spindle bolt. Using a screw-driver remove the slotted head bolt from the inside of the frame.

Swing the leg into the upright position and by doing so lever the leg against the stop and remove from the machine.

Detach the return spring.

Replacement is the reversal of the removal procedure.

SECTION D9

REAR BRAKE PEDAL

Remove the clevis pin that secures the brake rod to the brake pedal and allow the rod to swing clear.

Remove the spindle by unscrewing the locknut from inside the frame.

Replacement is the reversal of the above.

SECTION D10

MUDGUARDS

T25T: Remove the two attachment bolts at the bracket suspended by the bottom yolk. Withdraw blade from between the forks.

T25SS: To detach the mudguard remove the joint bolts securing the retaining brackets to the fork legs. Note that the brackets are in two parts surrounding a rubber bush. Hence the mudguard is completely rubber mounted.

The rear mudguard can be removed complete with its support rail rear light and number plate. Remove the twinseat (see Section D7). Disconnect the rear harness at the junction snap connectors situated near the top of the left side suspension unit. Remove the five bolts and nuts securing the mudguard to the frame. Then remove the mudguard from the rear of the machine.

Replace the mudguard in the reverse manner and check that the rear light cables are not damaged at any point.

SECTION D11

AIR CLEANER

The carburetter air cleaner is of the disposable paper element type. If the machine is to be used under very dirty and dusty conditions, the cleaner should be changed regularly, e.g. every 1000 miles. Running the machine with a badly choked air cleaner will cause restricted maximum speed, and increase in fuel consumption and many other carburation troubles.

The air cleaner is contained behind the left side cover. This cover is removed by applying half a turn to the quick release screw in the top corner. To detach the element, remove the securing nut and withdraw the element.

Note. On no account should attempts be made to clean the element with compressed air or a solvent of some kind; this would undoubtedly damage the delicate structure.

Refer to fig D8 for details of the assembly.

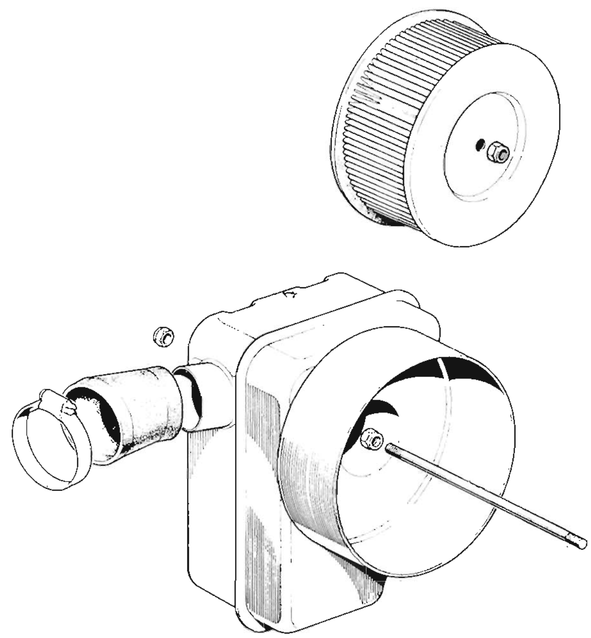


Fig. D8. Air cleaner

SECTION D12

ELECTRICAL BOX—DISMANTLING PROCEDURE

All the electrical components comprising of the ignition coil, 2MC capacitor, ignition capacitor, rectifier, ignition switch and zener diode are contained in a cast aluminium electrics box, (see fig. G1, Section G), attached to the frame beneath the fuel tank. If access is required for the purpose of replacing faulty components etc., the procedure is as follows:

(1) Remove the petrol tank. See section D15.

(2) Disconnect all external connections protruding from the box. Disconnect the oil pressure switch at the crankcase. Disconnect the H.T. lead at the coil and remove the front harness junction plug (see Fig. D10). Disconnect the horn. It will be easier to remove the electrical box with the horn and bracket still attached than to remove the box alone.

(3) Remove the three retaining nuts attaching the electrical box to the frame and withdraw it away from the machine.

(4) Remove the four bolts securing the lid of the electrical box and raise the lid from the open end towards the rear. At this point disconnect the zener diode (the large lucar connection on the underside of the lid).

(5) Disconnect the coil and then remove the two pozidrive screws retaining the coil securing clip and remove the coil from the box.

(6) Disconnect the capacitor and flasher unit contained in the large rubber moulding. Remove the two screws securing the moulding to the box and remove. As the moulding comes away disconnect the ignition capacitor from underneath.

(7) Disconnect the ignition switch and remove from the box.

(8) Disconnect the rectifier and detach it from the casing by removing the retaining nut from the outside wall of the box.

(9) Remove the two remaining screws securing the junction box and remove.

SECTION D13

BATTERY CARRIER AND TOOLBOX

Remove twinseat (see Section D7).

Access to the battery and tooltray is gained by removing the left and right-hand side covers. These covers are held in position by special screws that only require half a turn to release.

Disconnect the battery terminal connections, unclip the fixing strap and lift out the battery. Note that a vent pipe is connected to the battery top and is so arranged that corrosive fumes from the battery cells are directed clear of the machine.

The battery carrier and the tooltray are attached to the machine by two common bolts running through the top main tube. When these two bolts are removed, the battery carrier and tooltray can be removed from the machine. Note assembly of rubber bushes, washers and support grommet when reassembling (see fig. D9).

The rubber bushes help to insulate the battery and carrier from road shocks and vibration; therefore it is important to ensure correct reassembly.

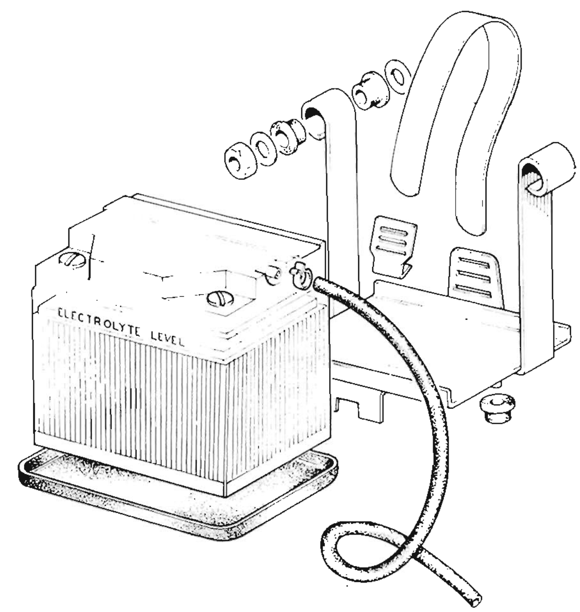


Fig. D9 Battery carrier assembly

SECTION D14

REMOVAL OF HEADLAMP

Remove the petrol tank (see Section D15). Disconnect the front harness at the electrical box (see fig. D10). Pull harness through the forks clear of the machine. Remove any clips securing the harness to the frame.

Remove the two retaining nuts at the fork bottom yolk pinch bolts.
Unscrew the two domed nuts at the top yolk and detach the headlamp from the forks.

Remember to adjust the headlamp to give the correct beam setting as detailed in section G13.

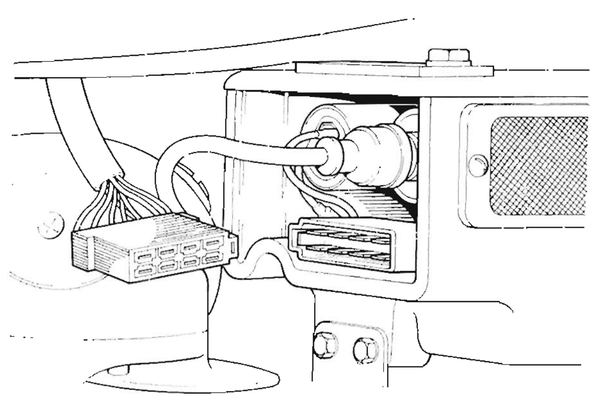


Fig. D10. Master electrical junction.

SECTION D15

PETROL TANK REMOVAL

Turn off both petrol taps and detach the petrol pipes from the taps by unscrewing the pipe union nuts. The petrol tank can be removed from the machine without disturbing the twinseat. But if difficulty is obtained with clearance at the rear of the tank, the seat should be removed as described in section D7. The tank on the T25T is made of light aluminium alloy and should not be abused in any way.

Remove the rubber grommet at the centre of the tank and remove the nut revealed. Pull off the washer and then pull the tank away from the machine.

Note assembly of the rubber buffers that sit on the top frame tube.

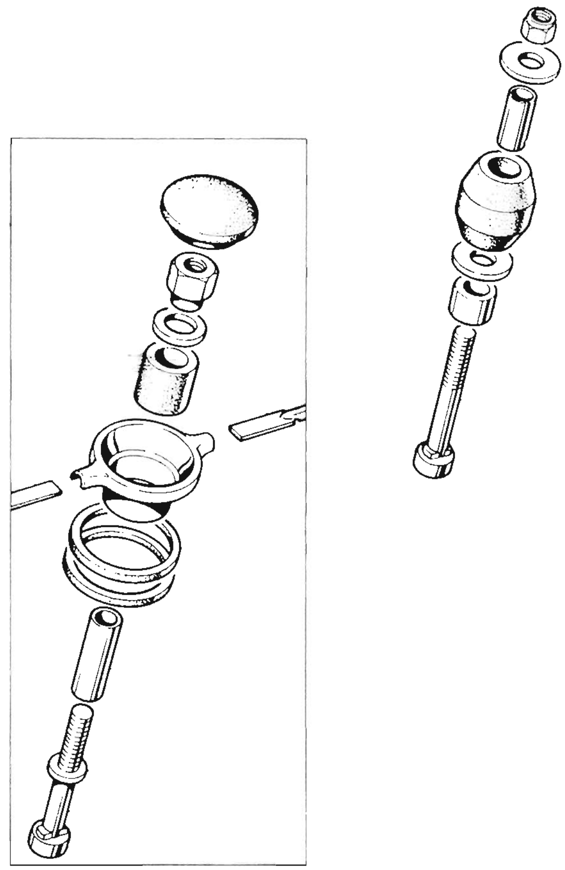


Fig. D11 Showing two types of mounting T25SS shown on the left

SECTION D16

APPLYING TRANSFERS (DECALS)

It should be noted that two types of transfers (decals) have been used on our models. These are are the traditional varnish applied type and the self-adhesive type.

Applying the self-adhesive type is merely a matter of removing the backing paper and pressing downwards onto the painted surface.

Applying the varnish type is slightly more difficult but with care a perfect finish will be achieved.

Firstly cut away the paper edging as close as possible to the transfer. Remove the tissue from the face o the transfer and separate one edge of the backing from the actual transfer to facilitate removal at a later stage. Varnish the face of the transfer and allow to dry for five minutes. Then place the tacky side of the transfer on to the part to which the transfer is to be fixed and carefully remove the thick backing paper.

Allow to dry for half an hour or so and then moisten the remaining backing paper with a wet rag or sponge. It can then be removed and the transfer must be varnished to preserve it.

SECTION D17

CENTRE STAND (WHERE FITTED)

The frame has provision for a centre stand and it is fitted as standard equipment on Home and General Export models.

The stand is attached to the frame with two special bolts and locknuts and uses a return spring.

SECTION D18

CONTROL CABLE REPLACEMENT

THROTTLE CABLE

First turn the twist grip to open the throttle, then, whilst pulling the cable sleeve, release the grip to allow the slotted cable stop to be removed. Now remove the two screws from the twist grip control and take off the top half to expose the cable nipple. Ease the nipple out of the grip and remove the cable.

Fit the replacement cable to the grip by inserting it up through the lower half and locating the nipple in its slot. Replace the top half of the grip, but, before tightening the screws, check that the grip turns freely. Do not replace the cable stop at this stage.

Proceed by removing the petrol tank (see Section D15) and detaching the cable from the frame clips.

Take out the two Phillips-head fixing screws and withdraw the carburetter top cover complete with throttle valve assembly. Compress the throttle spring, raise the needle with clip and after making careful note of its position, remove the needle clip to release the needle. Whilst still compressing the spring, push the cable downwards to release the nipple from its location in the valve. Take care not to lose the needle clip when taking off the spring and top cover.

First pass the replacement cable through the cable guide bracket then insert the cable through the top cap, spring and needle clip. Whilst compressing the spring, insert the cable nipple through the valve needle hole and locate to one side. Fit the valve needle and secure with the spring clip in the correct needle groove (second from the top). Assemble the throttle valve to the carburetter body, making sure that the needle enters the needle jet squarely. Locate the peg on the throttle valve with the slot in the mixing chamber and fit the top cap. Do not tighten the cap fixing screws until the throttle valve has been checked for correct operation.

Finally, attach the cable to the frame, replace the cable stop at the twist grip and adjust the cable as necessary (see Section C3).

CLUTCH CABLE

Unscrew and remove the handlebar lever fulcrum bolt and nut. Slacken the cable adjuster and swing the control lever away from the bracket, allowing the cable nipple to be released.

The adjuster and cable can now be withdrawn from the bracket. It will now be possible to release the nipple at the other end of the cable from the clutch actuating lever.

Replace the cable in the reverse manner and adjust as necessary to give correct operation.

Note. After adjustment, the control lever on the timing cover should take up a position approximately parallel with the timing cover joint face, when operated.

FRONT BRAKE CABLE (TWIN LEADING SHOE BRAKE)

To remove the cable, first slacken the adjustment at the handlebar lever. Push the inner cable through the nipple bush in the front brake lever (at wheel) until the cable nipple is clear of the counterbore in the bush. Withdraw the bush from the lever and collect two washers. Slide the tension spring off the cable from the rear brake lever (at wheel). Collect the bush from the lever. Finally remove nipple from handlebar lever.

To replace the cable, position the cable abutment bush in the rear brake lever and pass the cable through it.

Ensure that the cable abutment locates correctly in the counterbore. (See Fig. D12).

Replace the tension spring. Position the end of the cable inner between the fork of the front brake lever and position a steel washer to the outside of the cable. Hold the washer in this position by pressing the cable against the fork. Pass the cable nipple bush through the lever, washer and over the cable and position the steel washer on the inside of the inner cable. Push the bush through the second washer and locate the cable nipple in the counterbore.

FRONT BRAKE CABLE (SINGLE LEADING SHOE BRAKE)

To remove the front brake cable, first completely loosen the cable adjusters and pull the cable adjuster away from the handlebar lever bracket and slip the cable nipple out of the lever. In the case of cables fitted with a front stop switch it is also necessary to disconnect the spade terminals.

Replacement is simply a reversal of the above procedures but do not omit to re-adjust the brake cable and test the efficiency of the brake thoroughly before using the machine.

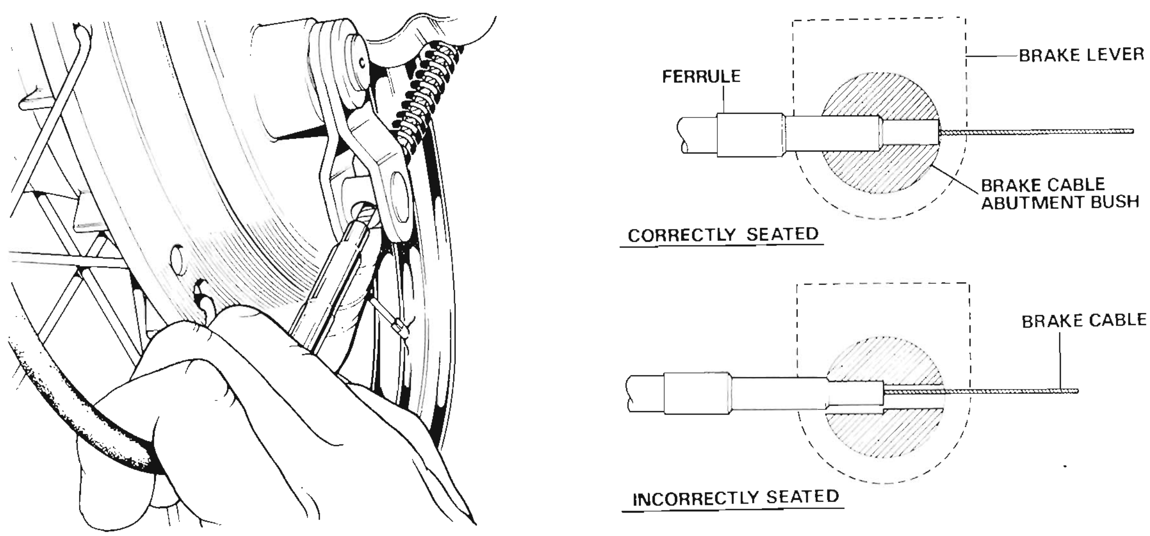


Fig. D12. Front brake cable abutment.

SECTION E

TELESCOPIC FORKS

INDEX

DESCRIPTION

The front fork is of the telescopic type using high grade steel tube stanchions. They are ground to a micro finish and hard chromium plated over their entire length.

The alloy bottom members are precision bored and provide the bearing for the stanchion. Internal main springs are fitted and locate on the damper tube.

An oil seal is contained in the top lip of each bottom member and is protected by a rubber dust cover.

Oil is contained in each bottom member and serves the dual purpose of damping and lubrication. Oil is added by removal of the fork cap nuts and drained at the plugs provided.

Damping of the fork action is achieved by the use of a damper valve in conjunction with a series of bleed holes in a fixed valve.

SECTION E1

STEERING HEAD ADJUSTMENT

It is most important that the steering head bearings are always correctly adjusted.

Place a strong support underneath the engine so that the front wheel is raised clear of the ground then, standing in front of the wheel, attempt to push the lower fork legs backwards and forwards. Should any play be detected, the steering head must be adjusted.

If possible, ask a friend to place the fingers of one hand lightly round the head lug, whilst the forks are being pulled back and forth. Any play will be felt quite easily by the fingers.

It should be possible to turn the forks from side to side quite smoothly and without any "lumpy" movement. If the movement is "lumpy", the rollers are indented into the races or broken. In either case the complete bearing should be renewed.

To adjust the steering head assembly, slacken the clamp nut B, Fig. E1 and the top yoke adjuster nut A then tighten down the adjuster nut until adjustment is correct. There should be no play evident in the races but great care must be taken not to overtighten, or the rollers will become indented into the races, making steering extremely difficult and dangerous.

Having carried out the adjustment, tighten the clamp nuts and the top yoke pinch bolt securely. Re-check the adjustment.

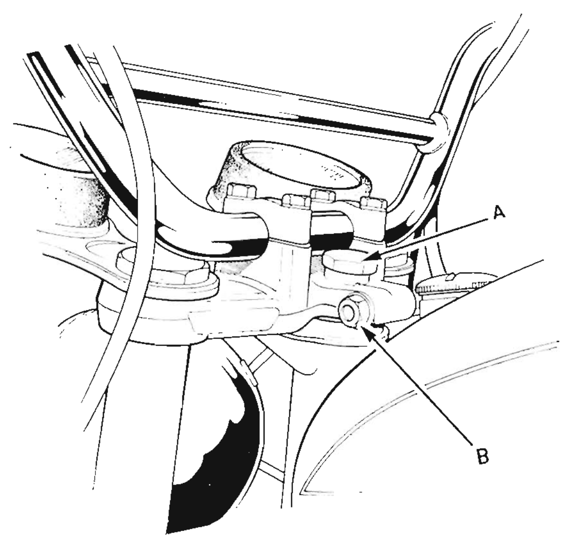


Fig. E1. Steering head adjustment

SECTION E2

RENEWING HEAD RACES

Place a strong support underneath the engine so that the front wheel is raised clear of the ground. Remove the front wheel (see Section F1). Remove the front mudguard (see page D10).

The steering head can be dismantled without stripping the forks. Remove the fuel tank (see page D11). With reference to page D10 remove the headlamp complete with mounting brackets. Disconnect the speedometer drive cable and the illumination light. Remove the four bolts securing the handlebars to the top lug and support the handlebars on the frame. Remove the fork cap nuts and place the speedometer to one side. Slacken the top yolk pinch bolt (*A*) and remove the adjuster nut (*B*).

Then using a raw-hide mallet strike the undersides of the top lug alternately to release it from its taper fit on the stanchions. Place the yolk to one side and withdraw the steering stem out of the head lug. The taper roller bearings can now be removed from the stem and the top lug for cleaning and inspection. Check for pitting and fracture of the roller surface. The bearing must be replaced if any of these faults are in evidence.

The steering head outer races have a very long serviceable life and should not need replacement for a very considerable mileage. If however their replacement is deemed necessary the races can be removed using a suitable drift from inside the head lug. Replacement of the new race is effected by using service tool 61–6113.

SECTION E3

STRIPPING AND REASSEMBLING THE FORK LEGS

Before commencing work on the forks it is advisable to have the following service tools and replacements available:

(a) Oil seal for dust excluder (2)

(b) Oil seal for damper valve (2)

(c) Service tool 61-6121

Remove the front wheel as described in Section F1. Unscrew the small drain plugs at the bottom of each fork leg adjacent to the wheel spindle and drain out the oil by pumping the forks up and down a few times. Support the machine on a box with the front forks clear of the ground. (Remove the front mudguard on SS models). Remove the handlebars by unscrewing the four retaining bolts at the head lug and lay the handlebars on the petrol tank with a layer of protective cloth underneath. Remove the fork cap nuts. Place the speedometer to one side after first disconnecting the drive cable and the illuminating light (similar treatment applies to the tachometer; where fitted).

Remove the internal fork springs. Using service tool 61–6121 placed down into the stanchion; hold the valve assembly while the retaining allen screw is being unscrewed at the base of the fork leg.

At this stage it will be possible to remove the fork leg by sliding it from the stanchion. The stanchions can remain in position on the machine and will only require removal if they are to be replaced because of damage (the stanchions are easily removed by slackening the pinch bolts on the bottom yolk and withdrawing the stanchions. When refitting tighten the pinch bolts to 18/20 lbs./ft.).

The dust cover on the fork leg can easily be prised off by hand.

The damper valve assembly is retained in the bottom of the stanchion by an aluminium nut which should be carefully removed with a ring spanner or similar.

The valve assembly consists of a fixed bleed valve which has its own oil seal, a clapper valve, a spring support nut and a rebound spring. It should not be necessary to strip this assembly unless the fixed bleed valve has contracted damage in any way.

The oil seal on the bleed valve can easily be replaced by hand. If using a screwdriver to prise the seal away from the valve be careful not to damage the bearing surface as the material is a soft alloy. (Refer to fig. E2 for details of the assembly).

Care must be taken not to lose the sealing washer contained in the bottom of the fork leg. The base of the valve stem rests on this seal and the allen screw is replaced from the outside of the leg. Refer to the exploded drawing on page E6 for assembly details.

The oil seal contained in the top of the fork leg can be removed with a tool of the design shown in fig. E3. This tool can be simply manufactured from a strip of mild steel material approx. 12in. long x 1in. wide and $\frac{3}{16}$–$\frac{1}{4}$in. depth. The design is such that the tool does not come into direct contact with the aluminium fork leg thereby causing unreparable damage.

As an alternate a long tyre lever carefully used will be found adequate. **Note.** When using either of these tools make several attempts to remove the seal by working around the periphery of the fork leg, otherwise the tool will rip through the lip of the seal.

Make sure the housing for the seal is clean and free from burns at the top edge and drift the new seal into the housing using the following method:—

Place the bore stanchion into the fork leg and place a small polythene bag over the top lip of the stanchion. Push the oil seal over the stanchion and down into position on the fork leg. It is important that the

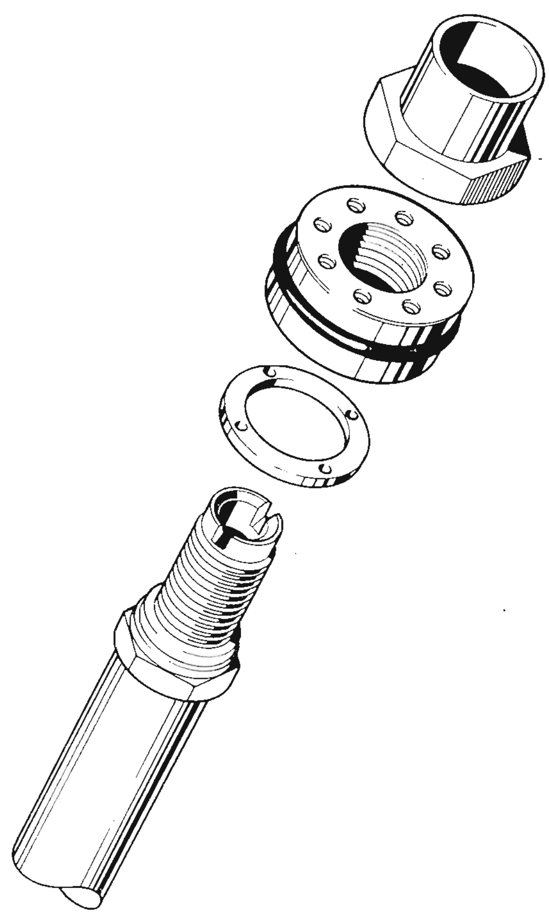


Fig. E2. Assembly of bleed valve.

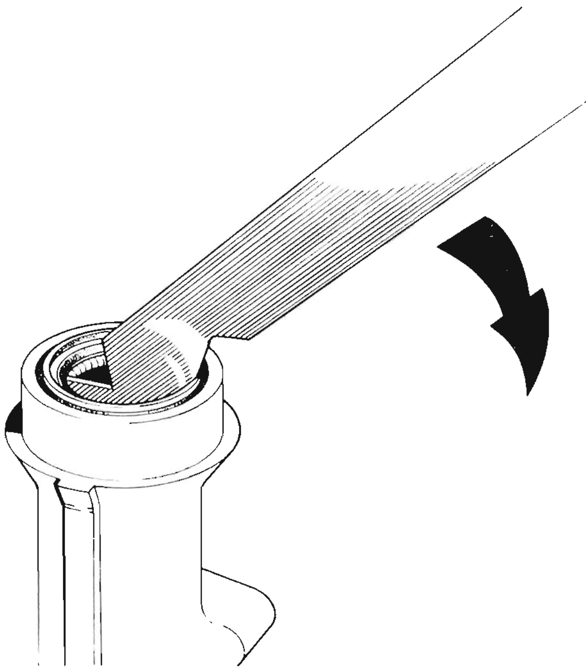


Fig. E3. Removing the oil seal from the fork leg.

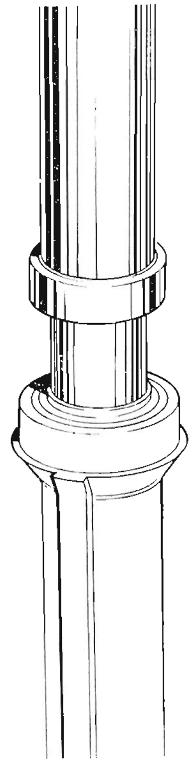


Fig. E4. Replacing the oil seal.

polythene is used because the lip of stanchion has a sharp edge that may easily scratch or damage the precision edge of the seal. Even a scratch that may not be readily visible to the eye will cause leakage at the seal. A drift will be required to replace the oil seal into the housing. This can be simply fabricated from an early type steel fork outer member. A turned shoulder will have to be machined and brazed or welded to one end of the fork leg. See fig. E4 for details. It is important to assembly the oil seal with the stanchion in position because the seal **must** sit squarely in the counterbore otherwise leakage will occur.

The stanchion can now be removed.

Check all components for cleanliness and wash in fuel if necessary. Examine the bore of the stanchion and clean with a cloth pushed into the bore.

Reassembly of the fork leg is a reversal of the dismantling procedure. Replace the valve into the bottom of the stanchion. Apply some red loctite to the aluminium retaining nut and tighten to a torque of 25 ft./lbs.

Check that the small "Dowty" sealing washer is located in the well in the base of the fork leg. (If this washer shows signs of damage or wear it must be replaced).

Push the rubber dust cover onto it's location groove on the fork leg and then replace the leg on the stanchion.

As the leg is refitted onto the stanchion the stem of the damper valve assembly must be located on top of the "Dowty" sealing washer. If difficulty is encountered during this operation, service tool 61-6121 which is used to retain the valve assembly while it is being removed may be used to navigate the damper valve onto its location.

The allen screw can then be replaced into the bottom of the fork leg and tightened as described above.

Replace the fork springs and refill the fork legs with the correct quantity of oil. Replace the fork cap nuts including the speedometer (and tachometer, where fitted) and tighten them to a torque of 40 ft./lbs. Reconnect the speedometer drive and illumination light.

Replace the handlebars (see Section A17). Replace the front mudguard (SS models only, see Section D10). Refit the front wheel (see section F1).

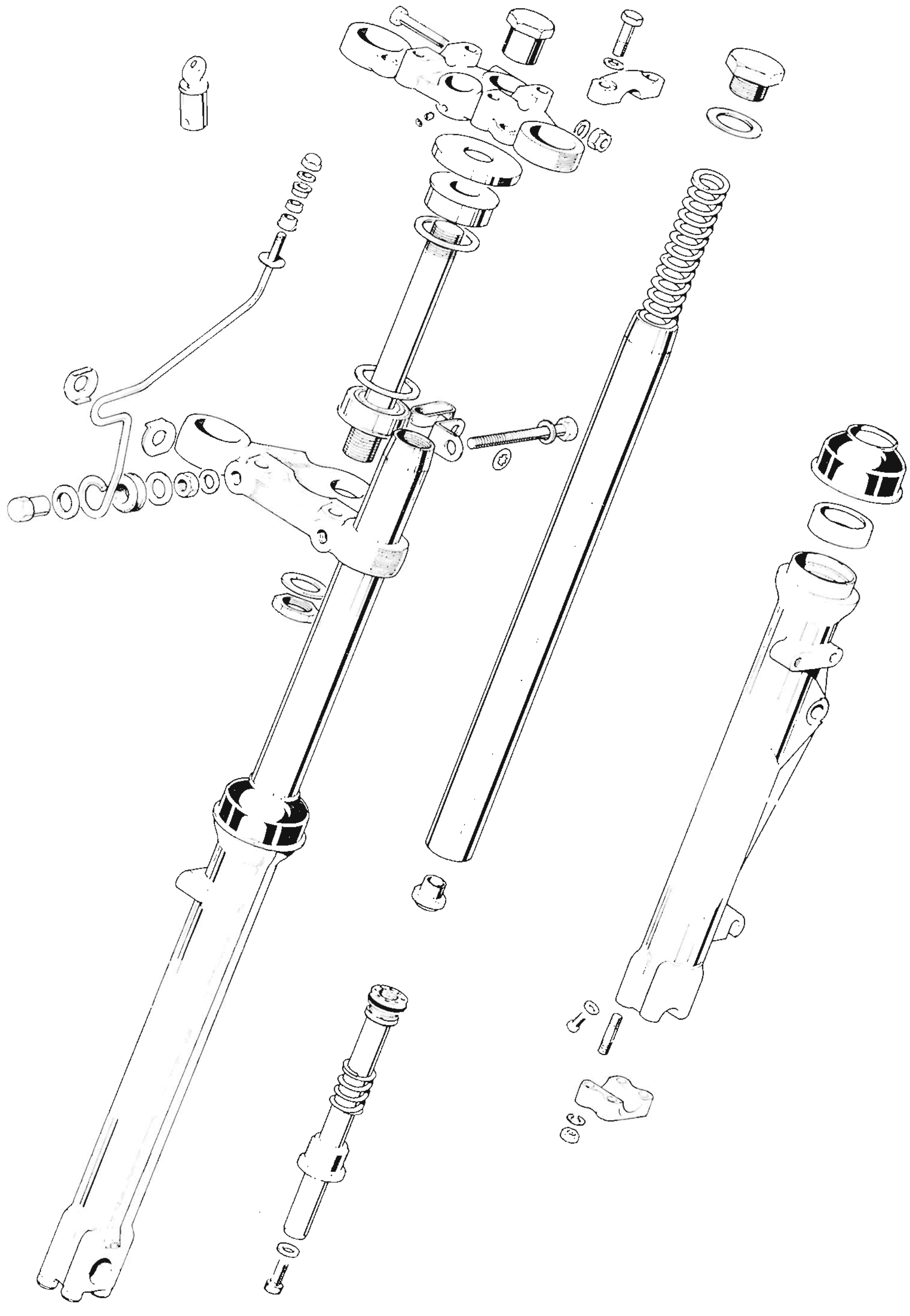
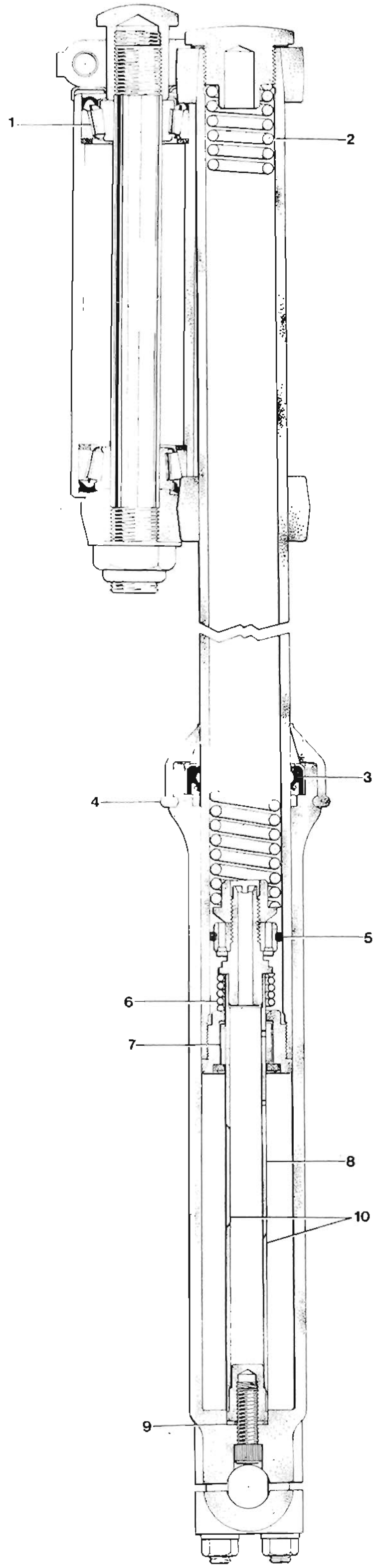


Fig. E5. Fork assembly details



1. HEAD BEARINGS
2. MAIN SPRING
3. OUTER MEMBER OIL SEAL
4. SCRAPER SLEEVE
5. DAMPER VALVE 'O' RING
6. RECOIL SPRING
7. PLASTIC SLEEVE
8. DAMPER TUBE
9. DAMPER TUBE CAP SCREW
10. BLEED HOLES—DAMPER TUBE

Fig. 6. Sectional view of assembled fork leg.

SECTION E4

FORK ALIGNMENT

After replacing the fork legs, mudguard and wheel, it may be found that the fork is incorrectly aligned.

To rectify this, the fork wheel spindle cap nuts must first be screwed up tight on the right-hand leg and the spindle cap on the left-hand leg slackened off. Also loosen the top caps and the pinch bolts in both the bottom and top yokes. The forks should now be pumped up and down several times to line them up and then tightened up from bottom to top, that is, wheel spindle, bottom yoke pinch bolts, top caps and finally, the steering stem pinch bolt in the top yoke.

If, after this treatment, the forks still do not function satisfactorily then either the fork stanchions are bent or one of the yokes is twisted.

The stanchions can only be accurately checked for straightness with special equipment such as a surface plate. Special gauges are also required to check the yokes. It is possible, however, to make a reasonable check of the stanchions by rolling them on a surface plate or flat surface such as a piece of plate glass, but it is not a simple operation to straighten a bent tube, and a new part may be necessary.

Check the stanchions for truth by rolling them slowly on a flat checking table. A bent stanchion may be realigned if the bow does not exceed $\frac{5}{32}$ in. maximum. To realign the stanchion, a hand press is required. Place the stanchion on two swage "V" blocks at either end and apply pressure to the raised portion of the stanchion. By means of alternately pressing in this way and checking the stanchion on a flat table the amount of bow can be reduced until it is finally removed.

Having checked the stanchions for straightness and reset as necessary, the top and bottom yokes can now be checked. First, assemble the two stanchions into the bottom yoke so that a straight edge across the lower ends is toughing all four edges of the tubes, then tighten the pinch bolts. Now view them from the side; the two stanchions should be quite parallel. Alternatively, the lower 12 in. of the stanchions can be placed on a surface plate, when there should be no rocking.

To reset, hold one stanchion in a vice (using soft clamps) and reposition the other stanchion, using a longer and larger diameter tube to obtain sufficient leverage. Having checked the stanchions this way, check the gap between them on the ground portion.

The next step is to place the top yoke in position over the stanchions, when the steering stem should be quite central.

The final step is to check if the tubes are parallel when assembled into the top yoke only. In this case the bottom yoke can be fitted loosely on the tubes, acting as a pilot only.

Though it is permissible to rectify slight errors in alignment by resetting, it is much safer to replace the part affected especially when there is excessive misalign ent. Works reconditioned units are available to owners in the United Kingdom through the dealer network.

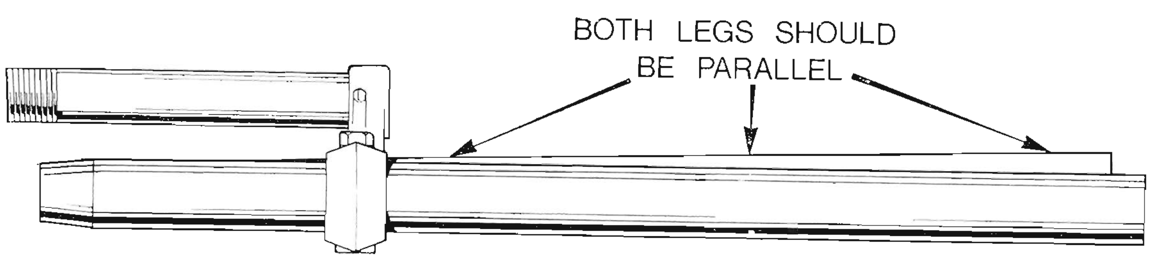


Fig. E7. Fork leg alignment

SECTION E5

HYDRAULIC DAMPING

Note the valve assembly which is retained in the bottom of the fork leg. Bleed holes are contained in the valve stem and in a sub-assembly at the top of the stem. This particular valve operates in conjunction with a damper valve which acts as a restrictor.

Oil is contained in the bottom member the level of which is always above the valve assembly. On compression the oil is forced through bleed holes in the valve stem. As the travel increases the bleed holes are progressively sealed off by a plastic sleeve and the damping increases until finally the stanchion is trapped on a cushion of oil which acts as the final bump stop. During this operation a vacuum is created in the space formed between the bottom of the stanchion and the damper valve, hence oil is transferred into this compartment through the eight bleed holes in the valve.

On expansion the oil in this newly formed compartment is compressed, the damper valve closes and the oil is bled through four small holes in the damper valve itself and then progressively through the holes in the valve stem. While this operation is being executed, oil is transferred back into the bottom member in readiness for the next compression.

SECTION F

WHEELS, BRAKES AND TYRES

INDEX

SECTION

SECTION F1

REMOVING AND REFITTING THE FRONT WHEEL

Place the machine with the front wheel approximately six inches off the ground. First, unscrew the handlebar front brake adjuster then disconnect the cable at the actuating lever on the brake plate. (See Section D18) Disconnect the torque arm at the fork leg (6in. brake).

Unscrew the four wheel spindle cap nuts from the base of each fork leg and remove the wheel.

Refitting the wheel is the reversal of the above instructions. (Ensure that the peg on the brake plate engages in the slot behind the fork on 8in. brake models).

Tighten the spindle cap nuts evenly a turn at a time.

Finally reconnect the front brake cable and adjust.

SECTION F2

REMOVING AND REFITTING THE FRONT WHEEL BEARINGS

Remove the front wheel from the fork (see Section above). Remove the retaining nut and withdraw the front anchor plate from the brake drum. Unscrew the retainer ring (left hand thread) using service tool 61–3694.

The right bearing can be removed by using the spindle and driving through from the left side. Withdraw the inner grease retaining disc. To remove the left bearing, spring out the circlip and insert the spindle from the right side, driving the bearing out complete with inner and outer grease retainer plates.

Fully clean all parts in paraffin (kerosene). Clean and dry the bearings thoroughly. Compressed air should be used for drying out the ball races. Test for end float and inspect the balls and races for any signs of pitting. If there is any doubt about their condition, the bearings should be renewed.

To refit the bearings, first insert the left inner grease retainer, bearing and outer dust cap, using a liberal amount of grease (see Section A18). Refit the spring circlip and insert the shouldered end of the wheel spindle from the right, using it as a drift to drive the bearing and grease retainer until they come up to the circlip. Re-insert the spindle the opposite way round and refit the right hand grease retainer disc. Drive the right bearing into position well smeared with grease, then screw in the retainer ring (left hand thread) until tight).

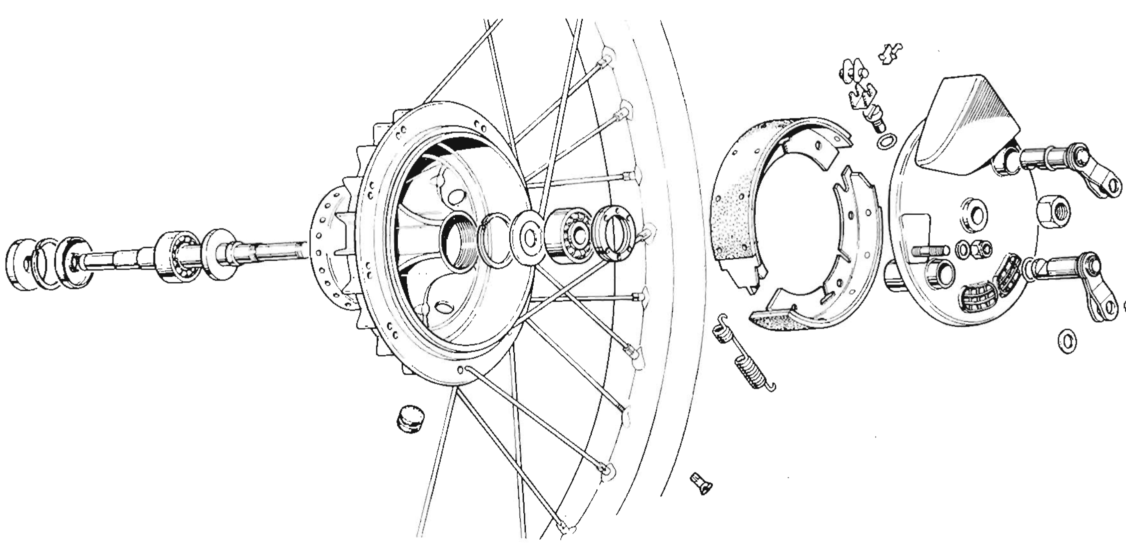


Fig. F1. Exploded view of front wheel bearing arrangement (8 in. brake models)

Finally, tap the spindle from the left to bring the spindle shoulder up against the right bearing. Refer to Fig. F1 for correct layouts. Reassembly then continues as a reversal of the above instructions.

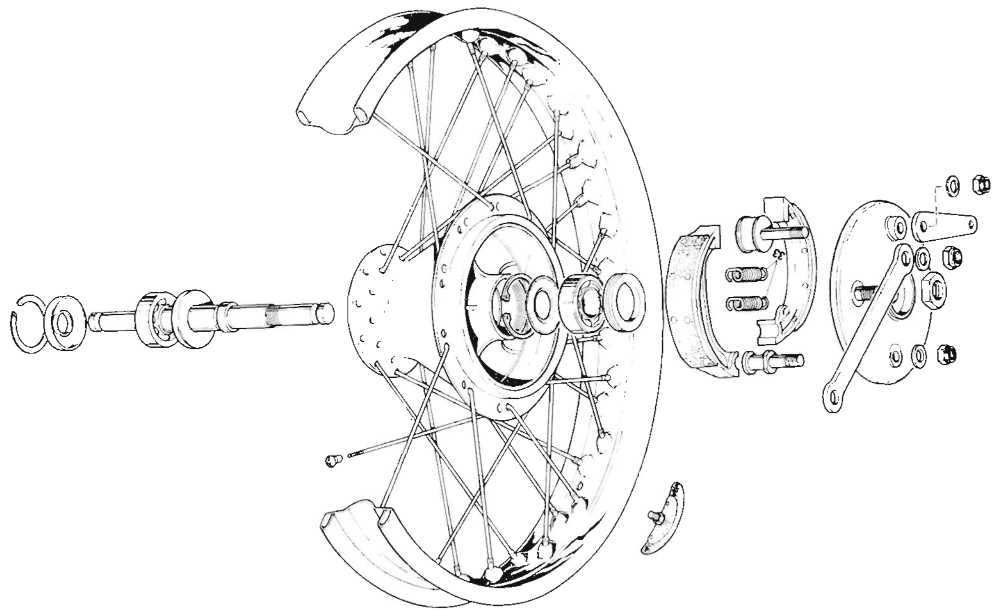


Fig. F2. Brake assembly details. 6 in. brake

SECTION F3

STRIPPING AND REASSEMBLING THE FRONT BRAKE TWIN LEADING SHOE TYPE (8in. BRAKE)

Access to the front brake shoes is gained by removing the wheel (see Section F1). The brake plate is retained by a centre nut. This is recessed into the anchor plate and will require the use of a thin box spanner. The brake plate assembly will then lift away complete. Pull the leading side of one shoe away from the snail cam and lift it over towards the other brake shoe.

Disconnect the springs and remove shoes. (See Fig. F3).

Remove the brake shoe actuating plungers from their housings on the brake plate. Note the "O"-ring on the tappets. Replace them if suspect. The cam and lever assembly can now be removed from the brake plate. The rubber "O"-ring on the spindle should also be replaced if necessary. Note the assembly of the snail cam adjuster and inspect for wear on the teeth.

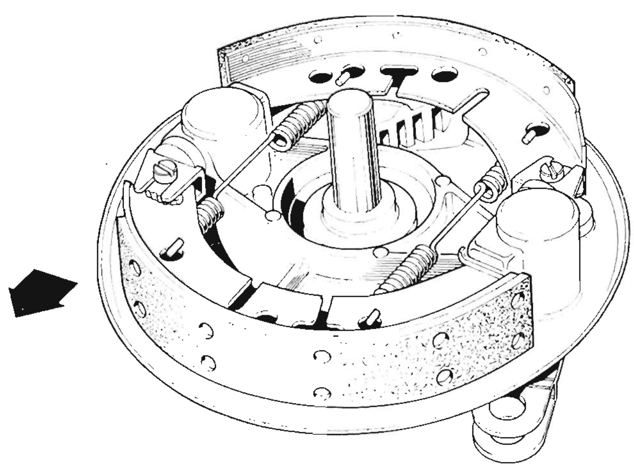


Fig. F.3 Removing brake shoes—2LS condition

INSPECTION PROCEDURE

(1) Examine the anchor plate for cracks or distortion, particularly in the brake cam housing.
(2) Clean out the grease in the brake cam spindle and remove any rust with a fine emery cloth.
(3) Inspect the return springs for signs of fatigue and distortion. Renew them if necessary.
(4) Examine the brake drum for scoring or ovality. In the case of the rear wheel if the drum requires skimming it should be removed from the wheel. Do not skim more than ·010in. from the drum. If the diameter exceeds more than given in the GENERAL DATA by more han ·010 in. the drum should be renewed.
In the case of the front wheel drum, scoring or signs of ovality can be ermoved by similar procedure.
(5) Examine the brake shoes. The brake linings should be replaced immediately the rivets show signs of having worn level with the linings face, or the linings show signs of cracks or uneven wear. Also check that the brake shoes are not cracked or distorted in any way.

To reassemble the shoes, first grease the cam and the actuating plunger and then assemble them into the brake plate. Assemble the springs onto the brake shoes (as shown in fig. F4) and holding the shoes apart rest them onto the brake plate with the snail cam adjusters in position. Then force the shoes apart and into their respective locations.

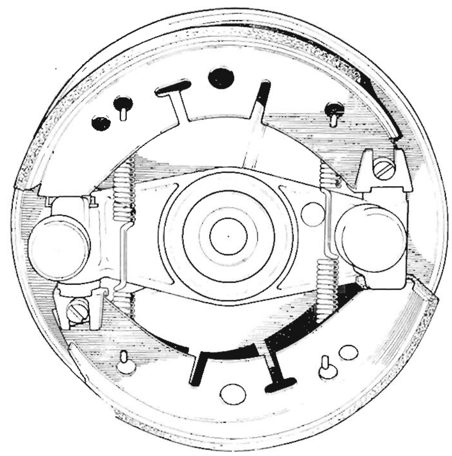


Fig. F4. 2LS brake assembled showing position of shoes

While replacing the shoes the anchor plate can be effectively supported by gripping a spindle of suitable size in a vice and placing the plate onto it (see fig. F3).

The complete brake plate is now ready for fitting to the wheel. Replace the anchor plate over the wheel spindle and lock it home with the spindle nut.

Finally, refit the wheel and adjust the brake (see Sections F1 and F8).

SECTION F4

STRIPPING AND REASSEMBLING THE FRONT BRAKE SINGLE LEADING SHOE TYPE (6in. Brake)

Access to the brake shoes is obtained by removing the wheel and unscrewing the central nut which retains the brake anchor plate. If the brake operating lever is then turned to relieve the pressure of the shoes against the drum, the complete brake plate assembly can be withdrawn from the spindle.

Remove the brake shoes by lifting one brake shoe away from the brake plate until the return spring becomes disconnected.

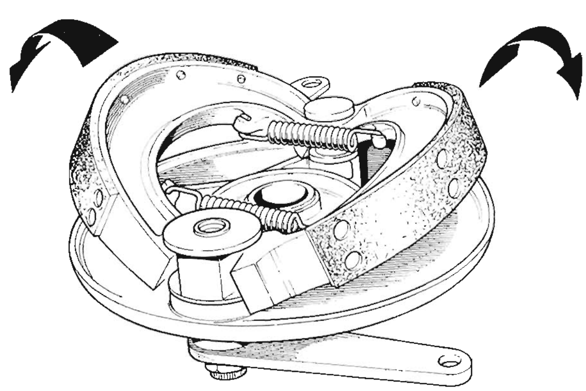


Fig. F5. Reassembling brake shoes (6in. brake)

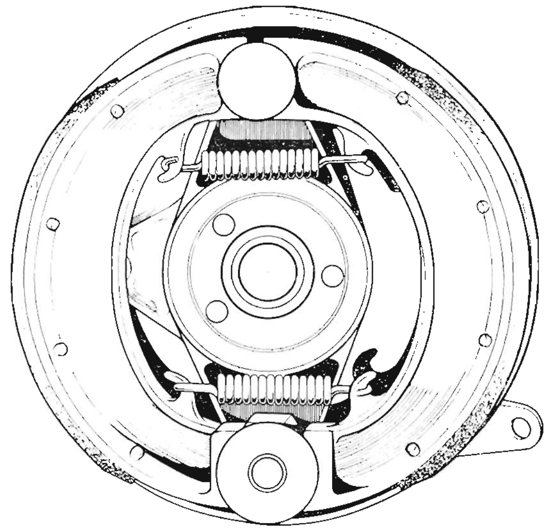


Fig. F6. Correct assembly of brake shoes onto front anchor plate.

To re-assemble the brake shoes to the brake anchor plate first place the two brake shoes on the bench in their relative positions. Fit the return springs to the retaining hooks, then taking a shoe in each hand (see Fig. F5) and at the same time holding the springs in tension, position the shoes as shown over the cam and fulcrum pin and snap down into position by pressing on the outer edges of the shoes.

Note. When replacing the brake shoes, note that the leading and trailing brake shoes are not interchangeable in either the front or rear brake and ensure that they are in their correct relative positions as shown in Fig. F6.

Re-assembly then continues by placing the anchor plate over the wheel spindle and locking it with the spindle nut. Refer to Section F13 for final re-alignment of the wheel if this is found to be necessary.

The front brake has fully floating adjusters and therefore the shoes are automatically self centralising.

The adjustment of the front brake operating mechanism is by means of a knurled adjuster nut incorporated in the handlebar abutment. Turn the nut anti-clockwise to take up the slack in the control cable. The correct adjustment is with not less than $\frac{1}{16}$ in. (1·5 mm.) and not more than $\frac{1}{8}$ in. (3 mm.) slack in the inner cable at the handlebar lever.

SECTION F5

STRIPPING AND REASSEMBLING REAR BRAKE

Access to the rear brake shoes is gained by removing the rear wheel (see section F6). Remove the brake plate and remove the shoes as described in Section F4.

Reassemble as described in Section F4.

The rear brake has a fully floating cam and therefore the shoes are automatically self centralising.

Adjustment of the rear brake is achieved by the wing nut on the rear end of the brake operating rod. Turn the nut clockwise to reduce clearance. From the static position before the brake is applied there should be about $\frac{1}{2}$in. (1·2 cm.) of free movement before the brake starts to operate.

SECTION F6

REAR WHEEL REMOVAL AND REPLACEMENT

Support the machine on a suitable stand so that the rear wheel is approximately 12in. clear of the ground. Uncouple the rear chain at its spring link and remove it from the rear wheel sprocket. Leave the chain in position on the gearbox sprocket; this will much simplify replacement. Unscrew and remove the rear brake rod adjuster. Push the rod clear of the brake lever.

Disconnect the speedometer drive cable at the drive gearbox at the right side of the rear wheel. Remove the left side pillion footrest; this will release the brake torque arm. Remove the wheel spindle nut from the right side and while supporting the wheel with one arm withdraw the spindle from the left side with the aid of a tommy bar. The wheel can now be removed.

SECTION F7

REMOVING AND REPLACING REAR WHEEL BEARINGS

The hub is fitted with two identical single row ball bearings which are a press fit into the hub.

Remove the speedometer drive ring (left hand thread) from the right side and the bearing retaining ring (right hand thread) from the left side. Use service tool No. 61–3694 to remove bearing retainer.

Using a drift (of the dimensions shown in fig. F7) knock out the spacer tube contained between the bearings taking one bearing with it. This operation can be carried out from either side of the wheel. See fig. F8.

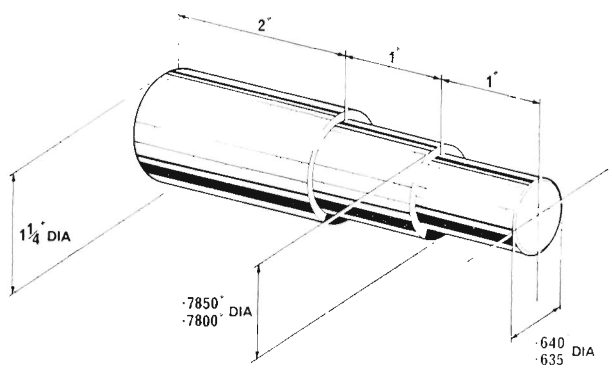


Fig F7. Wheel bearing drift

If a drift of the correct dimensions is not used then the spacer tube will be damaged and have to be replaced.

The bearing is an interference fit on the spacer tube and should be removed using the same drift as before. The spacer tube and drift can now be used to knock the remaining bearing out of the hub. Remove the bearing from the spacer tube.

To examine the bearings, wash thoroughly in paraffin and if possible, blow out with a high pressure air line. Examine each bearing carefully for signs of roughness indicating broken balls or damaged tracks, or excessive play.

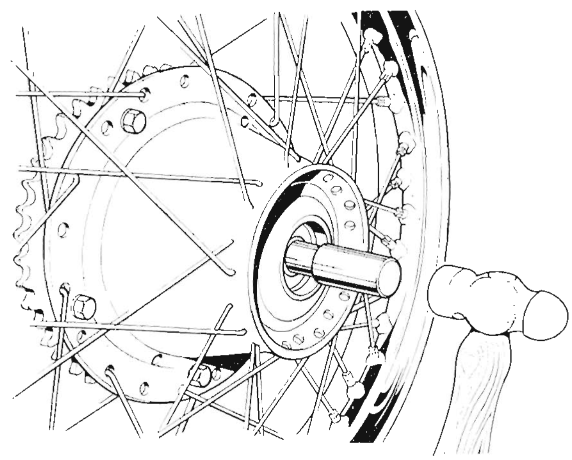


Fig. F8. Drifting the wheel bearings

The grease retainers behind the bearings should not require attention. But if replacement is necessary knock them out using a drift from inside the hub.

Replace the bearing onto the spacer tube and place the assembly into the hub from the left side. Drift the bearing into the housing and down onto the grease retainer with a suitable diameter drift. Force must be applied to the outer ring of the bearing and not the inner ring. If possible use a hand press for replacing these bearings.

Replace the retaining ring and tighten using tool No. 61–3694. Replace the remaining bearing from the right side.

Reassembly of the hub is simply the reverse of the dismantling procedure but, when pressing the bearings in, apply pressure only to the outside ring of the bearing and ensure that the retainer on the left-hand side is quite tight.

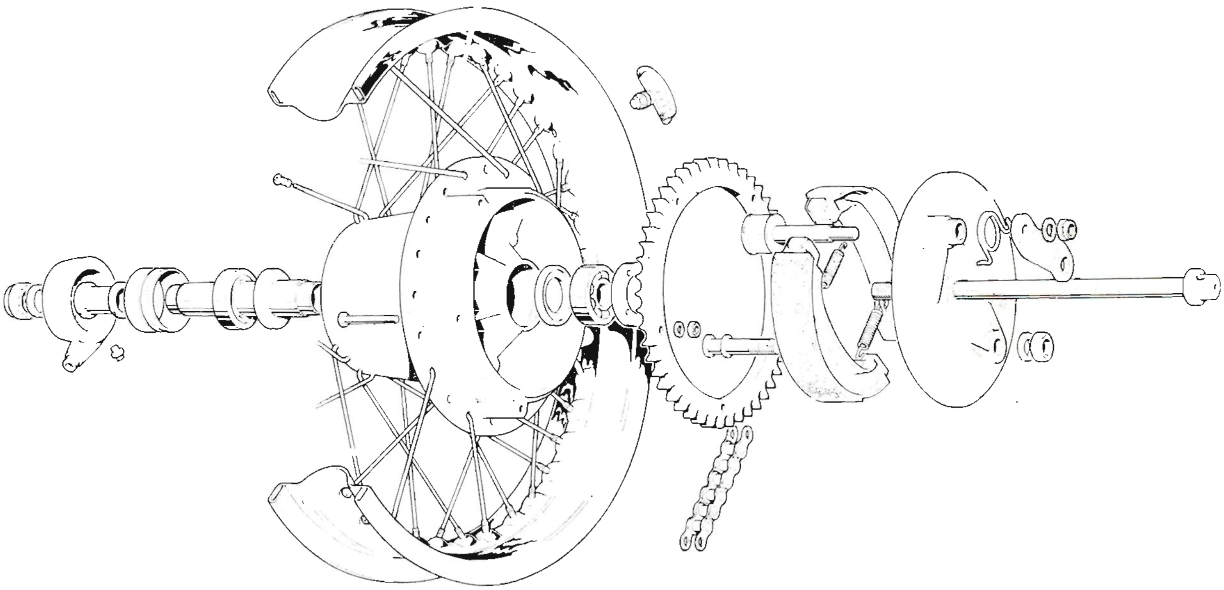


Fig. F.9. Exploded view of rear wheel assembly

SECTION F8

BRAKE ADJUSTMENT

The brakes must be adjusted to give maximum efficiency at all times and for this to be maintained, the shoes should be just clear of the drum when the brake is off, and close enough for immediate contact when the brake is applied. The brakes must not be adjusted so closely, however, that they are in continual contact with the drum; excessive heat may be generated, resulting in deterioration of braking efficiency.

On twin leading shoe brakes the expansion of the shoes is equalised by the caliper action of the cam levers. The cable adjuster is combined with the control lever on the handlebar and should be set to eliminate slackness without applying the brakes. After considerable mileage it may be necessary to re-position the shoes within the brake drum.

Individual adjustment of the shoes is provided by a screw at the actuating tappet of each screw. Slacken off the cable adjuster at the handlebar lever and remove the rubber grommet from the hub shell. Rotate the wheel until the aperture is opposite to the adjuster screw. The adjuster turns with a series of clicks and must be rotated in a clockwise direction until it cannot be turned any further. At this point the shoes will be fully expanded against the drum. Now unscrew the adjustor until the wheel is free to rotate and the shoe is just clear of the drum. Turn the wheel through half a revolution and repeat the adjustment on the remaining shoe. Check that the wheel revolves freely. Now adjust the clearance in the cable at the adjuster on the control lever. Turn the knurled nut until there is approximately $\frac{1}{16}$in. to $\frac{1}{8}$in. slack in the cable at the lever.

On single leading shoe front brakes the adjustment is taken up at the handlebar lever as for the twin leading shoe brake. **Note:** The brakes are not adjustable within the drum on this brake. When the range of adjustment has been reduced at the handlebar lever drive to where the cable can be adjusted by means of an integral adjuster situated just below the stop light switch.

The rear brake is adjusted by turning the self-locking sleeve in a clockwise direction (viewed from the rear of the machine), to shorten the effective length of the brake rod and so open the shoes in the drum.

Note that if maximum efficiency is to be obtained, the angle between the brake cable or rod and the operating lever on the brake plate should not exceed 90° when the brake is fully applied.

On single leading shoe brakes. When new front brake shoes have been fitted or if, during dismantling of the front wheel, the fulcrum pin was disturbed, the shoes must be centralized within the drum. To do this, slacken the fulcrum pin nut and operate the brake cam so as to open the brake shoes. The fulcrum pin will then position itself in the housing until both shoes are pressing equally on to the drum. Tighten the fulcrum pin nut firmly and release the brake.

The rear brake shoes are of the fully-floating type (i.e., they are not pivoted on a fulcrum) and are therefore self-centralizing.

SECTION F9

REAR CHAIN ADJUSTMENT

The rear chain must be adjusted when the wheel is at its lowest point of suspension travel. Support the machine with the rear wheel clear of the ground and rotate the wheel slowly until the tightest point on the chain is found, then check it's up and down movement in the centre of the chain run. The total movement should be $1\frac{1}{8}$in. and if it varies from this setting, then the chain must be adjusted by altering the position of the swinging arm.

The rear brake stop light must be allowed to swing clear of the left side cam plate. This is easily done by removing the rearmost bolt and allowing the switch assembly to swing in a clockwise direction. (Note the assembly of spacer and washers for this bolt.)

Slacken the large nut on the right side of the swinging arm spindle sufficiently to allow the cam plates at each end of the spindle to come away from their retaining dowels. (The spindle will need to be tapped from the right side to achieve this condition.) It is not necessary to loosen the torque stay nuts but the brake rod adjuster must be slackened off to allow for movement.

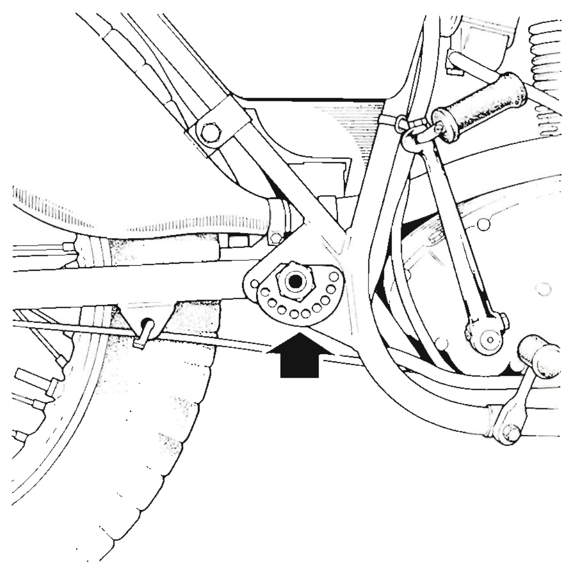


Fig. F10. Rear chain adjusting plates

The cam plates at both ends of the swinging arm spindle can now be rotated clockwise or anti-clockwise to make the adjustment. They must be placed in the same relative position on their respecgive dowels (see fig. F10).

The nut on the swinging arm spindle can now be fully retightened.

SECTION F10

RENEWING BRAKE LININGS (REAR BRAKE) (AND SINGLE LEADING SHOE FRONT BRAKE)

Hold the shoe firmly in a vice and, using a good sharp chisel, cut off the peened-over portion of the rivet as shown below.

Drive out the rivets with a suitable pin punch and discard the old lining. Reverse the shoe in the vice and draw-file the face of the shoe to remove any burrs.

Clamp the new lining tightly over the shoes and, using the shoe holes as a jig, drill straight through the lining with a $\frac{5}{32}$ in. diameter drill.

Remove the clamps and, holding the lining carefully in the vice, counterbore or countersink (according to the type of rivet used) each hole to no more than two-thirds the thickness of the lining, i.e., if the lining is $\frac{3}{16}$ in. thick, then the counterbore must not be deeper than $\frac{1}{8}$ in.

Having prepared the linings for riveting, start at the centre and position the lining with one or more rivets.

Place a suitable mandrel in the vice, clamp the linings to the shoes with either small "G" or toolmakers clamps and peen-over the rivets as shown in Fig. F12, working alternatively outwards from the centre.

The mandrel used in the vice must be flat on the end and the diameter should be no more than that of the rivet head. It will also help to bed the rivet down if a hollow punch is used before peening.

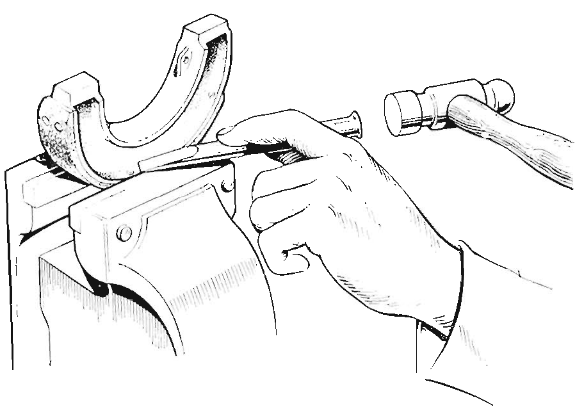


Fig. F11. Chiselling off brake rivets

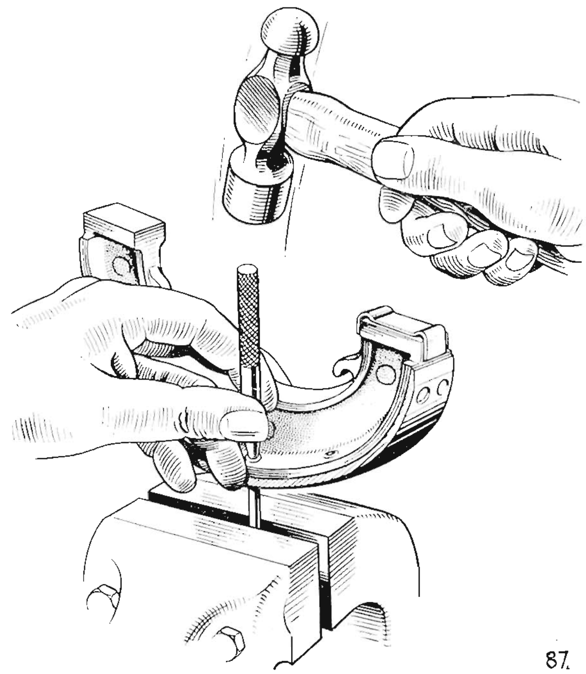


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Fig. F12. Punching lining rivets

Note. If the clamps are used correctly, that is, next to the rivet being worked on, the linings can be fitted tightly to the shoe.

If the linings are fitted incorrectly, a gap will occur between the lining and the shoe, resulting in inefficient and "spongy" braking.

When the riveting is completed, file a good chamfer at each end of the lining to approximately half its depth and lightly draw-file the face of the lining to remove any fraze caused by the drilling.

SECTION F11

WHEEL BUILDING

This is a job which is best left to the specialist as it is essential that the wheel is laced correctly and that when truing, the spokes are correctly tensioned.

It is however, possible for the less experienced to avoid trouble by periodically examining the wheels. As spokes and nipples bed down the tension will be lost and unless this is corrected the spokes will chafe and ultimately break.

Periodically test the tension either by "ringing", that is striking with a metal tool or by placing the fingers and thumb of one hand over two spokes at a time and pressing them together.

If tension has been lost there will be no ringing tone and the spokes will move freely across each other.

When a spoke needs tensioning, the nipple through the rim must be screwed further on to the spoke but at the same time, the truth of the wheel must be checked and it may be necessary to ease the tension at another part of the wheel in order to maintain its truth.

It will therefore be obvious that spoke replacement, spoke tensioning or wheel truing are not operations to be treated lightly.

Careful examination of the wheel will show that for every spoke there is another pulling in the opposite direction and that the adjacent spoke goes to the opposite side of the hub.

Increasing the tension tends to pull the rim so, to counteract this, it is sometimes necessary to increase the tension on the spoke or spokes either side to maintain the truth of the wheel.

With a little care and patience it is possible for the unskilled to at least re-tension the spokes but, turn each nipple only a little at a time as, once the spoke is under tension only a fraction of a turn is sometimes sufficient to throw the rim badly out of truth.

SECTION F12

WHEEL BALANCING

When a wheel is out of balance it means that there is more weight in one part than in another. This is very often due to variation in the tyre and at moderate speeds will not be noticed but at high speeds it can be very serious, particularly if the front wheel is affected.

Wheel balancing can be achieved by fitting standard one ounce and half ounce weights which are readily available, as required. All front wheels are balanced complete with tyre and tube before leaving the factory and if for any reason the tyre is removed it should be replaced with the white balancing "spot" level with the valve. If a new tyre is fitted, existing weights should be removed and the wheel re-balanced, adding weights as necessary until it will remain in any position at rear. Make sure that the brake is not binding while the balancing operation is being carried out.

For normal road use it is not found necessary for the rear wheel to be balanced in this way.

SECTION F13

WHEEL ALIGNMENT

Due to the design of the swinging arm and rear wheel arrangement the alignment of the wheels cannot be adjusted.

Assuming that the machine has not suffered any damage the wheels will automatically remain in line.

If however, alignment is suspect for any reason, it can easily be checked. Use a straight edge of steel or wood the length of which should be as in fig. F13. Lay the straight edge on two blocks on one side of the machine.

If the tyres are the same size and the wheels in alignment the straight edge will be touching the tyre at four points.

If the front tyre is of smaller section then it should be as in fig. F13.

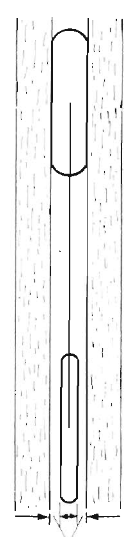


Fig. F13. Checking alignment

SECTION F14

BRAKING PERFORMANCE DATA

The following information is in accordance with the requirements of the U.S. Federal Highway Administration, Department of Transportation.

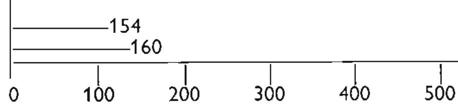
This figure indicates braking performance that can be met or exceeded by the vehicles to which it applies, without locking the wheels, under different conditions of loading.

The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

Description of vehicles to which this table applies:—
TRIUMPH T25T TRAIL BLAZER

A. Fully Operational Service Brake

LOAD
LIGHT
MAXIMUM



Stopping distance in feet from 60 m.p.h.

This figure indicates passing times and distances that can be met or exceeded by the vehicles to which it applies, in the situations diagrammed below.

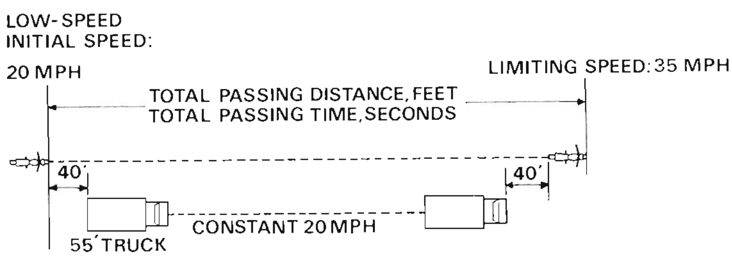
The low-speed pass assumes an initial speed of 20 m.p.h. and a limiting speed of 35 m.p.h. The high-speed pass assumes an initial speed of 50 m.p.h. and a limiting speed of 80 m.p.h.

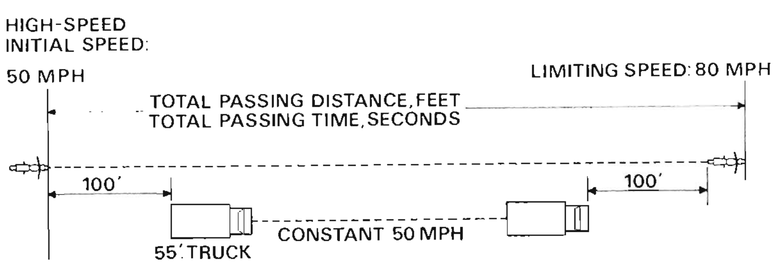
Notice:—The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

Description of vehicles to which this table applies:—
AS ABOVE

Summary Table

LOW-SPEED PASS 396 feet; 8·6 seconds
HIGH-SPEED PASS 1384 feet; 15·3 seconds





The following information is in accordance with the requirements of the U.S. Federal Highway Administration, Department of Transportation.

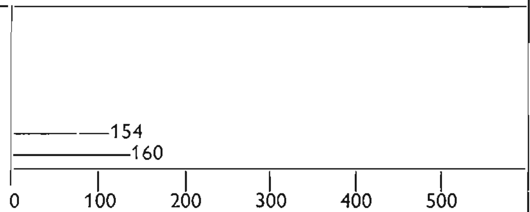
This figure indicates braking performance that can be met or exceeded by the vehicles to which it applies, without locking the wheels, under different conditions of loading.

The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

Description of vehicles to which this table applies:—
TRIUMPH TS25S BLAZER SS

A. Fully Operational Service Brake

LOAD
LIGHT
MAXIMUM



Stopping distance in feet from 60 m.p.h.

This figure indicates passing times and distances that can be met or exceeded by the vehicles to which it applies, in the situations diagrammed below.

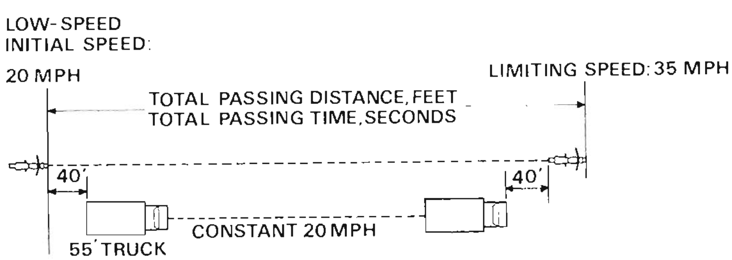
The low-speed pass assumes an initial speed of 20 m.p.h. and a limiting speed of 35 m.p.h. The high-speed pass assumes an initial speed of 50 m.p.h. and a limiting speed of 80 m.p.h.

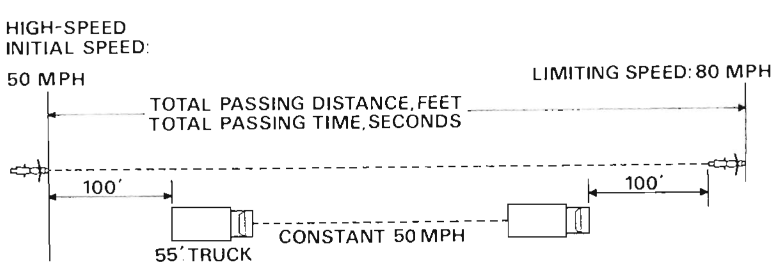
Notice:—The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

Description of vehicles to which this table applies:—
AS ABOVE

Summary Table

LOW-SPEED PASS 396 feet; 8·6 seconds
HIGH-SPEED PASS 1384 feet; 15·3 seconds





SECTION F15

REMOVING AND REFITTING TYRES

To remove the tyre first remove the valve cap and valve core, using the valve cap itself to unscrew the core. Unscrew the knurled valve securing nut and then place all parts where they will be free from dirt and grit. It is recommended that the cover beads are lubricated with a little soapy water before attempting to remove the tyre. The tyre lever should be dipped in this solution before each application. First, insert a lever at the valve position and whilst carefully pulling on this lever, press the tyre bead into the well of the rim diametrally opposite the valve position (see Fig. F14). Insert a second lever close to the first and prise the bead over the rim flange. Remove the first lever and reinsert a little further round the rim from the second lever. Continue round the bead in steps of two to three inches until the bead is completely away from the rim. Push the valve out of the rim and then withdraw the inner tube. To completely remove the tyre first stand the wheel upright and then insert a lever between the remaining bead and the rim. The tyre should be easily removed from the rim as shown in Fig. F15.

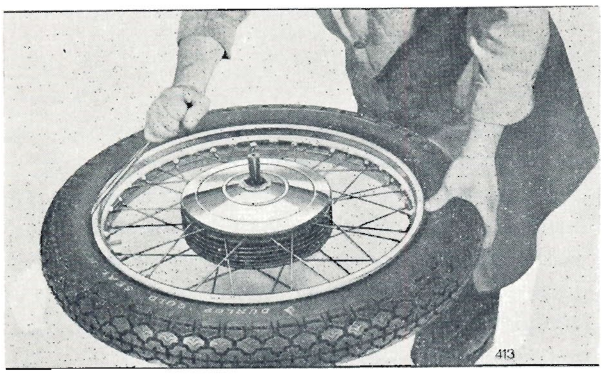


Fig. F14. Removing the first bead of the tyre—Lever inserted close to valve whilst bead is pressed into well on opposite side of wheel

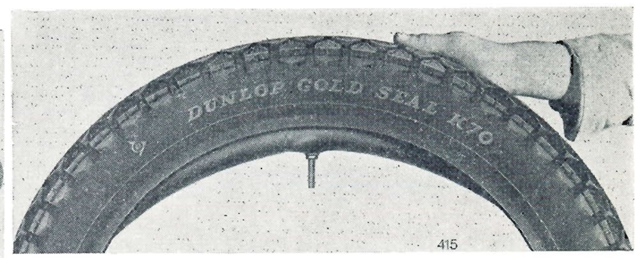


Fig. F16. Cover and tube assembled ready for refitting to the wheel

REFITTING THE TYRE

First place the rubber rim band into the well of the rim and make sure that the rough side of the rubber band is fitted against the rim and that the band is central in the well. Replace the valve core and inflate the inner tube sufficiently to round it out without stretch, dust it with french chalk and insert it into the cover with the valve located at the white "balancing spot" leaving it protruding outside the beads for about four inches either side of the valve.

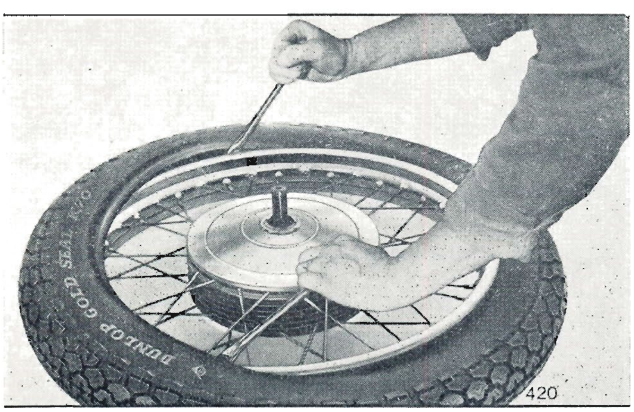


Fig. F15. Removing the first bead of the tyre, using two tyre levers

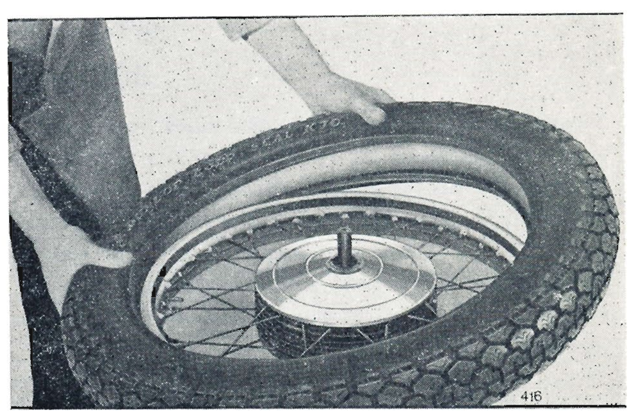


Fig. F17. Refitting the tyre to the wheel. Note valve engaged in rim hole

At this stage it is advisable to lubricate the beads and levers with soapy water (see Fig. F16).

Squeeze the beads together at the valve position to prevent the tube from slipping back inside the tyre and offer the cover to the rim, as shown in

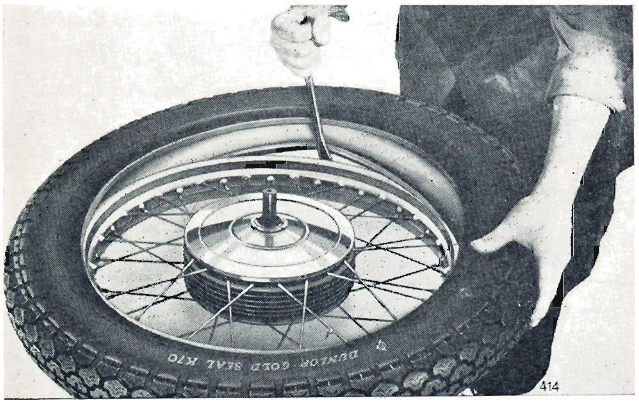


Fig. F18. Levering the first bead onto the rim

Fig. F17, at the same time threading the valve through the valve holes in the rim band and rim. Allow the first bead to go into the well of the rim and the other bead to lie above the level of the rim flange.

Working from the valve, press the first bead over the rim flange by hand, moving forward in small steps and making sure that the part of the bead already dealt with, lies in the well of the rim. If necessary use a tyre lever for the last few inches, as shown in Fig. F18. During this operation continually check that the inner tube is not trapped by the cover bead.

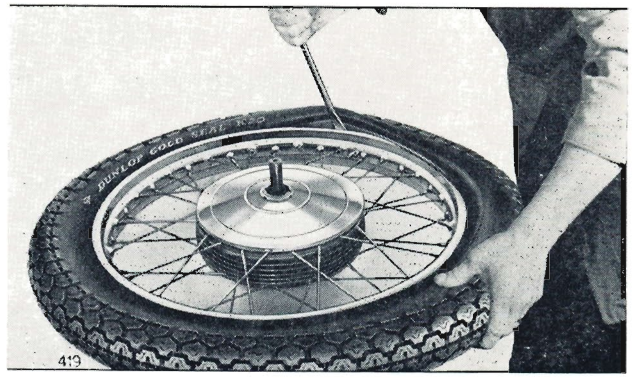


Fig. F19. Refitting the second bead over the wheel rim. Care must be taken not to trap inner tube

Press the second bead into the well of the rim diametrally opposite the valve. Insert a lever as close as possible to the point where the bead passes over the flange and lever the bead into the flange, at the same time pressing the fitted part of the bead into the well of the rim. Repeat until the bead is completely over the flange, finishing at the valve position (see Fig. F19).

Push the valve inwards to ensure that the tube near the valve is not trapped under the bead. Pull the valve back and inflate the tyre. Check that the fitting line on the cover is concentric with the top of the rim flange and that the valve protrudes squarely through the valve hole. Fit the knurled rim nut and valve cap. The tyre pressure should then be set to the figure given in General Data.

SECTION F16

SECURITY BOLTS

Security bolts are fitted to the rear wheel to prevent the tyre "creeping" on the rim when it is subjected to excessive acceleration or braking. Such movement would ultimately result in the valve being torn from the inner tube. There are two security bolts fitted to the rear wheel, which are equally spaced either side of the valve and thereby do not affect the balance of the wheel.

Note. The security bolt nuts must not be overtightened, otherwise excessive distortion may occur.

Where a security bolt is fitted the basic procedure for fitting and removing the tyre is the same, but the following instruction should be followed:—

(1) Remove the valve cap and core as described.

(2) Unscrew the security bolt nut and push the bolt inside the cover.

(3) Remove the first bead as described.

(4) Remove the security bolt from the rim.

(5) Remove the inner tube as described.

(6) Remove the second bead and tyre.

For refitting the tyre and inner tube:—

(1) Fit the rim band.

(2) Fit the first bead to the rim without the inner tube inside.

(3) Assemble the security bolt into the rim, putting the nut onto the first few threads (see Fig. F20).

(4) Partly inflate the inner tube and fit it into the tyre.

(5) Fit the second bead but keep the security bolt pressed well into the tyre, as shown in Fig. F21, and ensure that the inner tube does not become trapped at the edges.

(6) Fit the valve stem nut and inflate the tyre.

(7) Bounce the wheel several times at the point where the security bolt is fitted and then tighten the security bolt nut.

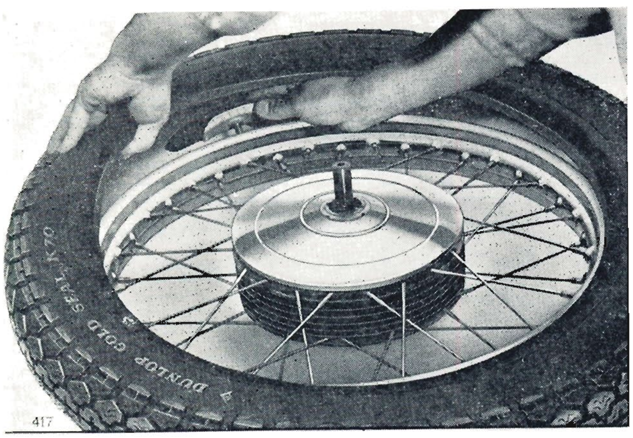


Fig. F20. Placing the security bolt in position

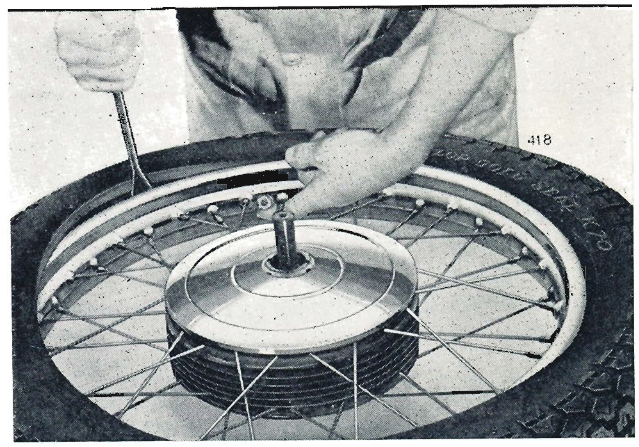


Fig. F21. Refitting the second bead with the security bolt in position

SECTION F17

TYRE MAINTENANCE

To obtain optimum tyre mileage and to eliminate irregular wear on the tyres it is essential that the recommendations governing tyre pressures and general maintenance are followed. The following points are laid out with this in mind.

(1) Maintain the correct inflation pressure as shown in "General Data". Use a pressure gauge frequently. It is advisable to check and restore tyre pressures at least once per week. Pressure should always be checked when tyres are cold and not when they have reached normal running temperatures.

(2) When a pillion passenger or additional load is carried, the rear tyre pressure should be increased appropriately to cater for the extra load.

(3) Unnecessary rapid acceleration and fierce braking should always be avoided. This treatment invariably results in rapid tyre wear.

(4) Regular checks should be made for flints, nails, small stones etc., which should be removed from the tread or they may ultimately penetrate and damage the casing and puncture the tube.

(5) Tyres and spokes should be kept free of oil, grease and paraffin. Regular cleaning should be carried out with a cloth and a little petrol (gasoline).

(6) If tyres develope irregular wear, this may be corrected by reversing the tyre to reverse its direction of rotation.

(7) If a sidecar is fitted then correct alignment should be maintained. The method for testing sidecar alignment is given in Section F14.

Before inflating, check that the fitting line on the tyre wall just above the bead on each side is concentric with the rim.

If necessary bounce the wheel to help seat the tyre but, see that there is adequate pressure to prevent damaging the tyre or tube and only use moderate force. If the tyre will not seat, it is better to release the pressure, apply soap solution to lubricate and re-inflate.

Inflate to the required pressure and check fitting lines again. Inflation should not be too rapid, particularly at the commencement, to allow the beads to seat correctly on the rim.

See that the valve protrudes squarely through the valve hole before screwing down the knurled nut and finally, replace the dust cap.

SECTION F18

TYRE PRESSURES

The recommended inflation pressures of 22 p.s.i. (front tyre) and 24 p.s.i. (rear tyre) are based on a riders' weight of 140 lb. If the riders' weight exceeds 140 lb. the tyre pressure should be increased as follows:—

Front Tyre
Add 1 lb. per square inch for every 28 lb. in excess of 140 lb.

Rear Tyre
Add 1 lb. per square inch for every 14 lb. in excess of 140 lb.

It is further recommended that when carrying a pillion passenger or equipment giving additional weight, the inflation pressures should be increased in relation to the actual load on each tyre, as indicated in the chart below. To find the load on each tyre, place the front and rear wheel in turn, on to a weighbridge. The reading should be taken when the rider is seated on the machine together with the additional weights.

	Inflation pressure (lb. per sq. in.)					
	16	18	20	24	28	32
	Load per tyre (lb.)					
Front	200	230	260	320	380	440
Rear	280	310	335	390	450	500

SECTION G

ELECTRICAL

INDEX

DESCRIPTION

The electrical system is supplied from an A.C. generator contained in the primary chaincase and driven directly from the crankshaft.

A Zener-Diode is connected in circuit to regulate the battery charging current and consequently prevent over-charging.

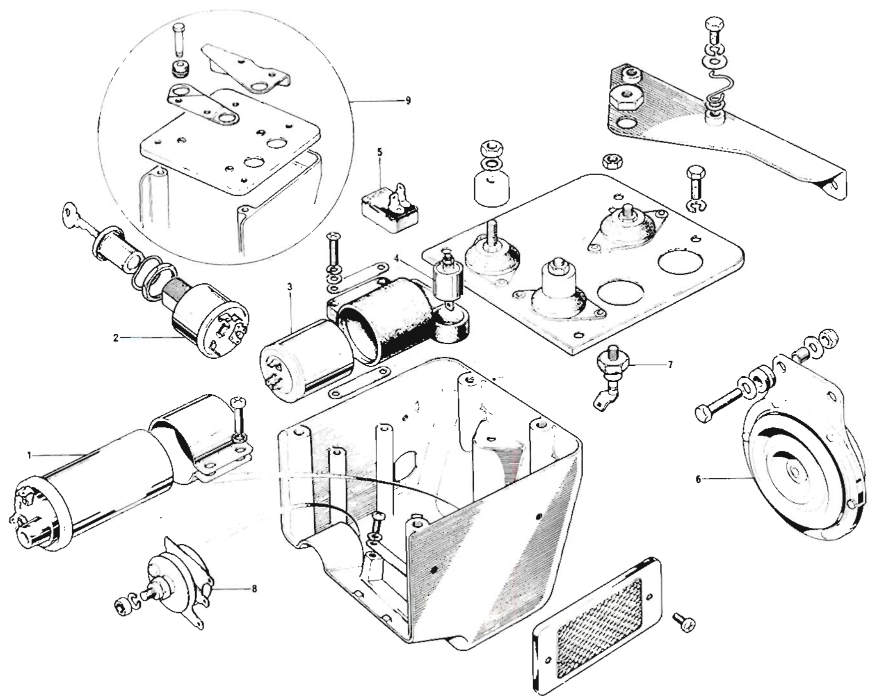
The ignition system is controlled by a contact breaker mechanism driven by the camshaft.

Routine maintenance required by the various components is detailed in the following sections. Whilst checking the electrical system, opportunity should be taken to ensure that all wiring connections and frame earthing points are clean and secure.

A capacitor (model 2MC) is integrated in the circuit on all models and when the battery earth lead (+VC) is disconnected the machine will continue to function quite normally.

All electrical components except the battery, lamps, horn and handlebar switches are housed in a rubber mounted electrical box situated beneath the fuel tank. The various items within the box are shown in fig. G1, and it should be noted that the lid of the aluminium box serves as the Zener Diode heat sink.

See Section D12 for details regarding the dismantling procedure for the electrical box.



1 IGNITION COIL
2 IGNITION SWITCH
3 CAPACITOR (2MC)
4 CONDENSER
5 FLASHER UNIT
6 HORN
7 ZENER DIODE;
8 RECTIFIER
9 ELECTRICAL BOX MOUNTINGS FOR LATER MODELS

Fig. G1. Electrical box components

SECTION G1

ALTERNATOR

The alternator consists of a spigot-mounted 6-coil laminated encapsulated stator with a rotor carried on and driven by an extension of the crankshaft. The rotor has an hexagonal steel core, each face of which carries a high-energy permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to aluminium side plates, the assembly being cast in aluminium and machined to give a smooth external finish.

There are no rotating windings, commutator, brush-gear, bearings or oil seals and consequently the alternator requires no maintenance apart from checking occasionally that the snap connectors in the output cables are clean and tight.

If rotor removal is necessary, there is no need to fit magnetic keepers to the rotor poles. When removed, wipe off any swarf which may have been attracted to the pole tips and put the rotor in a clean place until required for refitting.

SECTION G2

BATTERY INSPECTION AND MAINTENANCE

DESCRIPTION

The container for the model PUZ5A battery is moulded in transparent material through which the acid can be seen. The tops of the containers are so designed that when the covers are in position, the special anti-spill filler plugs are sealed in a common venting chamber. Gas from the filler plugs leaves this chamber through a vent pipe. Polythene tubing may be attached to the vent pipe to lead the corrosive fumes away from any parts of the machine where they might cause damage.

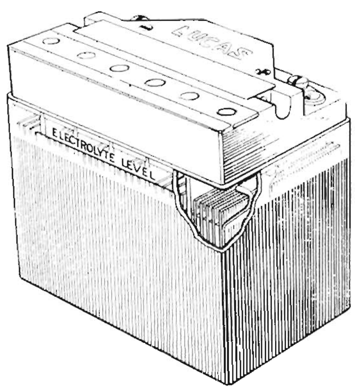


Fig. G2. The PUZ5A battery

PART A

CHARGING THE BATTERY

Whilst the battery leaves the factory in the fully "dry-charged" condition, it may slowly lose some charge in storage. In view of this, the following filling instructions must be carefully observed:—

With the acid, battery and room temperature between 60°F., and 100°F. (15.5/37.7°C.), remove the vent plugs and fill each cell to the coloured marker line.

Measure the temperature and specific gravity of the electrolyte in each of the cells.

Allow to stand for 20 minutes and then re-check the temperature and specific gravity of the electrolyte in each cell.

The battery is then ready for service **unless** the above checks show the electrolyte temperature to have risen by more than 10°F. (5.5°C.) or the specific gravity to have fallen by more than 10 'points', i.e., by more than 0.010 specific gravity.

In this event, it will be necessary to recharge the battery at the appropriate charge rate (0.7 amperes) until the specific gravity values remain constant for three successive hourly readings and all cells are gassing freely.

During charging, keep the electrolyte in each cell level with the coloured marker line by adding distilled water—**not** acid.

PART B

ROUTINE MAINTENANCE

Every 1,000 miles (1,600 km.) or monthly, or more regularly in hot climates the battery should be cleaned as follows:—

Remove the battery cover and clean the battery top. Examine the terminals: if they are corroded scrape them clean and smear them with a film of petroleum jelly, or with a silicone grease.

The level of the electrolyte in each cell should be checked weekly or every 250 miles. Lift the battery out of the carrier so that the coloured filling line can be seen. Add distilled water until the electrolyte level reaches this line.

Note. On **no** account should the battery be topped-up above the **coloured line.**

With this type of battery, the acid can only be reached by a miniature hydrometer, which would indicate the state of charge.

Great care should be taken when carrying out these operations not to spill any acid or allow a naked flame near the electrolyte. The mixture of oxygen and hydrogen given off by a battery on charge, and to a lesser extent when standing idle, can be dangerously explosive.

The readings obtained from the battery electrolyte should be compared with those given in the table opposite. If a battery is suspected to be faulty it is advisable to have it checked by a Lucas depot or agent.

A lead-acid battery slowly loses its charge whilst standing—the rate of loss being greater in hot climates. If a battery is not being used, it is important to give it freshening charges at the appropriate recharge rate. These should be given fortnightly in temperate climates and weekly in the tropics.

PART C

SPECIFIC GRAVITY OF ELECTROLYTE FOR FILLING THE BATTERY

U.K. and climates normally below 80°F. (26.6°C.)		Tropical climates over 80°F. (26.6°C.)	
Filling	Fully charged	Filling	Fully charged
1.260	1.270—1.290	1.210	1.210—1.230

To obtain a specific gravity strength of 1.260 at 60°F. (15.5°C.), add one part by volume of 1.840 specific gravity acid to 3.2 parts of distilled water.

To obtain a specific gravity strength of 1.210 at 60°F. (15.5°C.), add one part by volume of 1.840 specific gravity acid to 4.3 parts of distilled water.

PART D

MAXIMUM PERMISSIBLE ELECTROLYTE TEMPERATURE DURING CHARGE

Climates normally below 80°F. (26.6°C.)	Climates frequently above 80°F. (26.6°C.)
100°F. (38°C.)	120°F. (49°C.)

Note. The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60°F., which is adopted as a reference temperature. The method of correction is as follows:—

For every 5°F. below 60°F. deduct .002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F., add .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature. To take a temperature reading tilt the battery sideways and then insert the thermometer.

PART E

CHECKING D.C. INPUT TO BATTERY

(a) Connect D.C. ammeter in main battery line (between battery negative terminal and battery cable). Red lead to casle, black lead to battery terminal.

(b) Disconnect the Zener Diode. (Remove both the brown/blue cables from the 2MC capacitor.)

(c) Start the engine and run at approximately 3000 rev./min. Operate lighting switch.

Lighting switch position	MINIMUM CURRENT READING
	Two lead stator
OFF	4·5 A
H/lamp M/beam	1·0 A

CONCLUSIONS

If the above or higher readings are obtained the battery is in good condition.
If the readings are lower, test the alternator.

SECTION G3

COIL IGNITION SYSTEM

DESCRIPTION

The coil ignition system comprises an ignition coil, mounted in the electrical box and a contact breaker unit fitted in the timing cover. Apart from cleaning in-between the terminals, and checking the connections for soundness, the coil will not require any other attention. Testing the ignition coil is amply covered in Part "C", page G6, whilst testing the contact breaker is detailed in Part "D".

The best method of approach to a faulty ignition system is to first check the low-tension circuit for continuity as shown in Part "A", then follow the procedure laid out in Part "B" to locate the fault(s).

Failure to locate a fault in the low-tension circuit indicates that the high-tension circuit or sparking plug is faulty, and the procedure detailed in Part "E" must be adopted. Before commencing any of the following tests, however, the contact breaker the sparking plug gaps must be cleaned and adjusted and the battery connections checked to eliminate these possible sources of faults.

PART A

CHECKING THE LOW-TENSION FOR CONTINUITY

To check whether there is a fault in the low-tension circuit and to locate its position, the following tests should be carried out:—

First inspect the in-line fuse in the battery earth cable (brown/blue lead) and replace if suspect.

Check also the cut-out switch; this can be done by disconnecting the white, and white/yellow lead from the right handlebar switch and connecting them together. This will complete the ignition circuit by by-passing the cut-out switch.

PART B

FAULT FINDING IN THE LOW-TENSION CIRCUIT

To check whether there is a fault in the low tension circuit and to locate its position, the following tests should be carried out.

First inspect the in-line fuse situated in the battery Brown/Blue lead and replace if suspect: check also the cut-out switch; this can be done by disconnecting the White and White and Yellow leads from the right handlebar switch and connect together, this will complete the ignition circuit by passing the cut-out switch.

Connect a 0–15 volt D.C. voltmeter, with the black lead to the "CB" or "+" terminal of the coil and the red lead to earth. Turn the engine until the contacts open. With the ignition switched on, the voltmeter should read battery voltage. No reading indicates an open circuit ignition switch, coil primary winding or a short circuit across the contacts which can be confirmed by disconnecting the coil/contact breaker lead at the coil. If battery voltage is then indicated by the voltmeter the fault lies in the contacts or the circuitry from the coil to them. This fault is very often caused by incorrect assembly of the contact insulating washers.

Turn the engine until the contacts close and the voltmeter should then read zero. Any reading indicates the contacts are either burnt or dirty and should be cleaned or stoned flat.

Connect the voltmeter with the red lead to earth and the black lead to the "SW" or "–" terminal of the coil. Ensure the contacts are closed and switch on the ignition switch. Take careful note of the voltmeter reading then quickly transfer the black lead to the battery "–" terminal and again take careful note of the reading. The difference between the two readings should not exceed 0·5 volts. Readings in excess of this indicate a high resistance in the ignition feed circuit, faulty ignition switch or cut out button.

PART C

IGNITION COIL

The ignition coil consists of a primary and secondary winding, wound concentrically about a laminated soft iron core, the secondary winding being next to the core.

The primary and secondary windings of the coil have (280–372) 310 turn and 21,000 turns respectively of enamel-covered wire, the secondary being much finer. Each layer is paper insulated from the next on both primary and secondary windings.

To test the ignition coil on the machine, first ensure that the low-tension circuit is in order as described in Part "A", then disconnect the high-tension lead from the sparking plug. Turn the ignition switch to the IGN position and crank the engine until the contacts are closed.

Flick the contact breaker lever open a number of times whilst the high-tension lead from the ignition coil is held about $\frac{3}{16}$ in. away from the cylinder head. If the ignition coil is in good condition a strong spark should be obtained, if no spark occurs this indicates the ignition coil to be faulty.

Before a fault can be attributed to the ignition coil it must be ascertained that the high-tension cable is not cracked or showing signs of deterioration, as this may often be the cause of misfiring etc. It should also be checked that the ignition points are actually making good electrical contact when closed and that the moving contact is insulated from earth (ground) when open. It is advisable to remove the ignition coil and test it by the method described below. See Section D12 for removing ignition coil.

BENCH TESTING IGNITION COIL

Connect the ignition coil into the circuit shown in Fig. G3 and set the adjustable gap to 9 mm. With the contact breaker running at 600 r.p.m., not more than 5% missing should occur at the spark gap over a period of 15 seconds. The primary winding can be checked for short-circuit coils by connecting an ohmeter across the low-tension terminals. The reading obtained should be within the figures quoted below (at 20°C.).

Primary Resistance	
Minimum	Maximum
3.3 ohms	3.8 ohms

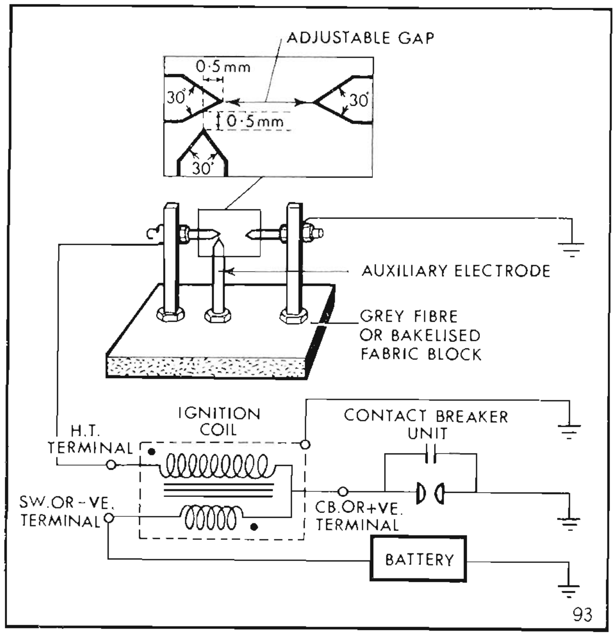


Fig. G3. Ignition coil test rig

PART D

CONTACT BREAKER

Faults occurring at the contact breaker are in the main due to, incorrect adjustments of the contacts or the efficiency being impaired by piling, pitting, or oxidation of the contacts due to oil etc. Therefore, always ensure that the points are clean and that the gap is adjusted to the correct working clearance as described section B17.

To test for a faulty condenser, first switch on the gnition, then take voltage readings across the contacts when open. No reading indicates that the condenser internal insulation has broken down.

Should the fault be due to a condenser having a reduction in capacity, indicated by excessive arcing when in use, and overheating of the contact faces, a check should be made by substitution.

Particular attention is called to the periodic lubrication procedure for the contact breaker which is given on page A10. When lubricating the parts ensure that no oil or grease gets on to the contacts.

If it is felt that the contacts require surface grinding then the complete contact breaker unit should be removed as described on page B17, and the moving contact disconnected by unscrewing the securing nut at the low tension lead, removing the lead and nylon bush. The spring and contact point can be removed from the pivot spindle. Grinding is best achieved by using a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a clean petrol (gasolene) moistened cloth. The contact faces should be slightly domed to ensure point contact. There is no need to remove the pitting from the fixed contact. When reassembling, the nylon bush is fitted through the low tension connection tab, and through the spring location eye. Apply a smear of grease to the C.B. cam and moving contact pivot post. Every 3,000 miles and/or contact replacement, apply two drops of clean engine oil to the rear of the three lubricating felt wicks.

PART E

CHECKING THE HIGH-TENSION CIRCUIT

If ignition failure or misfiring occurs, and the fault is not in the low-tension circuit, then check the ignition coil as described in Part "C". If the coil proves satisfactory, ensure that the high-tension cable is not the cause of the fault.

If a good spark is available at the high-tension cable, then the sparking plug suppressor cap or the sparking plug itself may be the cause of the fault.

Clean the sparking plug and adjust the electrodes to the required setting as described on page G.8 and then reset the engine for running performance. If the fault re-occurs then it is likely that the suppressor cap is faulty and should be renewed.

2MC ELECTROLYTIC CAPACITOR

The capacitor is an electrolytic polarised unit, which will be irreparably damaged if incorrectly connected.

TERMINAL IDENTIFICATION

Looking at the terminal end of the unit, two Lucar terminals of different sizes will be observed, the small terminal being the positive earth terminal: for identification the rivet has a red spot.

The double Lucar terminal is the negative connection.

The basic object of using the electrolytic capacitor in the system is to enable the motor cycle to be run without a battery giving the rider the advantage of using the machine for competition work, and re-fitting the battery for normal road use.

If the battery should be disconnected and the machine run on capacitor ensure that the negative (brown/blue) lead is well insulated.

PERIODIC CHECK

Disconnect the battery, start and run the engine. Full lighting should be available.
Conclusion.—If engine will not fire and run, proceed to next check.

EFFICIENCY CHECK

(1) Disconnect the capacitor.

(2) Connect the capacitor direct to a 12 volt battery for 5 seconds (see polarity note).

(3) Disconnect the battery and let the charged capacitor stand for 5 minutes.

(4) Connect a D.C. voltmeter across the terminals (see polarity note) and note the steady reading after the initial swing, which should not be less than 9 volts for a serviceable unit.

SERVICE NOTES

Before running the machine with the battery disconnected it is essential that the **battery negative lead be insulated** to prevent it from reconnecting and shorting to earth. This can be done by removing the fuse from its holder and replacing it with a length of $\frac{1}{4}$in. diameter wooden dowel or other insulating medium.

A faulty capacitor may not be apparent when used with a battery system. To prevent any inconvenience arising, periodically check that the capacitor is serviceable by disconnecting the battery to see if the machine will start easily.

Should the engine fail to start without the battery, substitute a new capacitor. If the engine still will not start, check the wiring between the capacitor and rectifier for possible open or short-circuit conditions. Also check the earth connections.

Do not run the machine with the Zener diode disconnected, as the capacitor will be damaged due to excessive voltage.

If difficulty is encountered in starting with a battery fitted, disconnect the capacitor to eliminate the possibility of a short-circuit.

SECTION G4
SPARKING PLUG

It is recommended that the sparking plug be inspected, cleaned and tested every 2,000 miles (3,200 km.) and a new one fitted every 10,000 miles (16,000 km.).

To remove the sparking plug a box spanner ($\frac{13}{16}$ in., 19·5 mm. across flats) should be used and if any difficulty is encountered a small amount of penetrating oil should be placed at the base of the sparking plug and time allowed for penetration.

Examine the plug for signs of petrol (gasolene) fouling. This is indicated by a dry, sooty, black deposit, which is usually caused by over-rich carburation, although ignition system defects such as a faulty contact breaker, coil or condenser defects, or a broken or worn out cable may be additional causes.

Examine the plug for signs of oil fouling. This will be indicated by a wet, shiny, black deposit on the central insulator. This is caused by excessive oil in the combustion chamber during combustion and indicates that the piston rings or cylinder bore is worn.

To rectify this type of fault the above mentioned items should be checked with special attention given to carburation system.

Overheating of the sparking plug electrode is indicated by severely eroded electrode and a white, burned or blistered insulator. This type of fault can be caused by weak carburation or over-advanced ignition timing although plugs which have been operating whilst not being screwed down sufficiently can easily become overheated due to heat that is normally dissipated through to the cylinder head not having an adequate conducting path. Overheating is normally symptomized by pre-ignition, short plug life, and "pinking" which can ultimately result in piston crown failure. Unnecessary damage can result from over-tightening the plugs. To achieve a good seal between the plug and cylinder head, screw the plug in by hand on to its gasket, then lightly tighten with a box spanner.

A plug of the correct grade will bear a light flaky deposit on the outer rim and earth electrode, and these and the base of the insulator will be light chocolate brown in colour. A correct choice of plug is marked (A). (B) shows a plug which appears bleached, with a deposit like cigarette ash; this is too "hot-running" for the performance of the engine and a cooler-running type should be substituted.

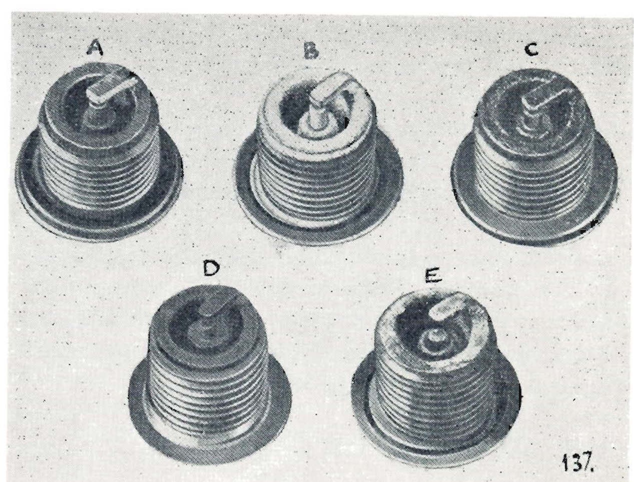


Fig. G4. Sparking plug diagnosis

A plug which has been running too "cold" and has not reached its self-cleaning temperature is shown at (C). This has oil on the base of the insulator and electrodes, and should be replaced by a plug that will burn off deposits and remove the possibility of a short-circuit. The plug marked (D) is heavily sooted, indicating that the mixture has been too rich, and a further carburation check should be made. At illustration (E) is seen a plug which is completely worn out and in need of replacement.

To clean the plug it is preferable to make use of a properly designed proprietary plug cleaner. The makers instructions for using the cleaner should be followed carefully.

When the plug has been carefully cleaned, examine the central insulator for cracking and the centre electrode for excessive wear. In such cases the plug will have completed its useful life and a new one should be fitted.

Finally, the sparking plug electrode should be adjusted to the correct gap setting of .025 in. (.635 mm.). Before refitting sparking plug the threads should be cleaned by means of a wire brush and a minute amount of graphite grease smeared on to the threads. This will prevent any possibility of thread seizure occurring.

If the ignition timing and carburation settings are correct and the plug has been correctly fitted, but overheating still occurs, then it is possible that carburation is being adversely affected by an air leak between the carburetter and the cylinder head.

This possibility must be checked thoroughly before taking any further action. When it is certain that none of the above mentioned faults are the cause of over-heating then the plug type and grade should be considered.

Normally the type of plug quoted in General Data is satisfactory for general use of the machine, but in special isolated cases, conditions may demand a plug of a different heat range. Advice is readily available to solve these problems from the plug manufacturer who should be consulted.

SECTION G5

CHARGING SYSTEM

DESCRIPTION

The charging current is supplied by the two lead alternator, but due to the characteristics of alternating current the battery cannot be charged direct from the alternator. To convert the alternating current to direct current a full wave bridge silicon type rectifier is connected into the circuit. The alternator gives full output, all the alternator coils being permanently connected across the rectifier.

Excessive charge is absorbed by the Zener Diode which is connected in parallel with the battery.

Always ensure that the ignition switch is in the OFF position whilst the machine is not in use, to prevent overheating of the ignition coils and discharging the battery.

Proceed to test the alternator as described in Part "A". If the alternator is satisfactory, the fault must lie in the charging circuit, hence the rectifier must be checked as given in Part "B" and then the wiring and connections as shown in Part "C".

PART A

CHECKING THE ALTERNATOR OUTPUT

Disconnect the two alternator output cables and run the engine at 3,000 r.p.m.

Connect an A.C. voltmeter (0–15 volts) with 1 ohm load resistor in parallel with each of the alternator leads in turn, and observe the voltmeter readings. A suitable 1 ohm load resistor can be made from a piece of Nichrome wire as shown in Part "D", page G12.

The test is conducted by connecting a voltmeter and the 1 ohm load resistor between the following cables and note the readings:—

Two Lead Stator

(a) White/green and green/yellow—Voltmeter should read 8.5 volts (minimum).

From the results obtained, the following deductions can be made:—

(1) If the readings are all equal to or higher than those quoted then the alternator is satisfactory.

(2) A low reading on any group of coils indicates either that the leads concerned are chafed or damaged due to running on the chain or that some turns of the coils are short-circuited.

(3) Low readings for all parts of the test indicate that either the green/white lead has become chafed or damaged due to rubbing on the chain or that the rotor has become partially demagnetized. As the latter is an extremely rare occurrence it is advisable to check by substitution before condemning the rotor. If it is found that the rotor has become demagnetized, check that it has not been caused by a faulty rectifier and that the battery is of correct polarity.

(4) A zero reading for any group of coils indicates that a coil has become disconnected, is open-circuit, or is earthed.

(5) A reading obtained between any one lead and earth indicates that coil windings or connections have become earthed.

If any of the above mentioned faults occur, always check the stator leads for possible chain damage before attempting repairs or renewing the stator.

It is beyond the scope of this manual to give instruction for the repair of faulty stator windings. However, the winding specification is given in the Table, on page G15 for those obliged to attempt repair work.

PART B

RECTIFIER MAINTENANCE AND TESTING

The rectifier is a silicon semi-conductor device which allows current to flow in one direction only. It is connected to provide full wave rectification of alternator output current.

The rectifier requires no maintenance beyond checking that the connections are clean and tight. The nuts clamping the rectifier plates together must not under any circumstances be slackened. A separate nut is used to secure the rectifier to the back of the toolbox and it is important to check periodically that the rectifier is firmly attached.

When tightening the rectifier securing nut, hold the spanner as shown in Fig. G5, for if the plates are twisted, the internal connections will be broken. Note the circles marked on the fixing bolt and nut indicating that the thread form is U.N.F.

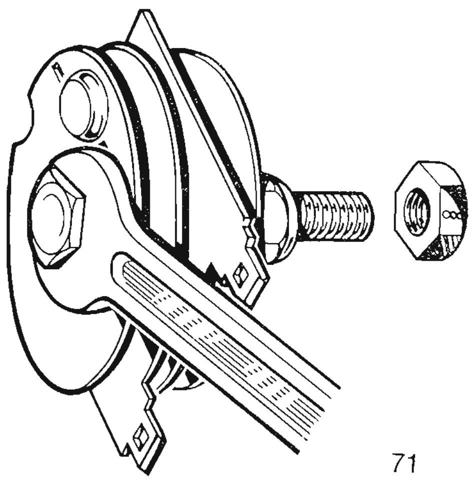


Fig. G5. Securing the rectifier

TESTING THE RECTIFIER ON THE MACHINE

(1) Disconnect the Zener Diode by removing the **straight** Lucar connector with the Brown/Blue cable from the 2MC capacitor.

(2) Locate the snap connector junction for the Brown/Blue cable to the box and disconnect.

(3) Connect a D.C. voltmeter (with the 1 ohm load in parallel) with the red lead to earth and the Black lead to the Brown/Blue cable from the box.

(4) Locate the White/Yellow cable in the other snap connector junction from the box, and using a jumper lead connect the cable from the box to the negative (−) terminal of the battery.

(5) Start the machine and run at approximately 3,000 rev./min., and take a reading from the voltmeter. This should read not less than 7·5 volts, which indicates the rectifier is operating satisfactorily. A lower reading indicates a fault in the rectifier which can be confirmed by a bench test.

(6) Stop engine before disconnecting the voltmeter.

BENCH TESTING THE RECTIFIER

For this test the rectifier should be disconnected and removed. Before removing the rectifier, disconnect the leads from the battery terminals to avoid the possibility of a short-circuit occurring.

Connect the rectifier to a fully charged 12 volt battery of approximately 40 ampere/hours capacity at the 10 hour rate, and 1 ohm load resistor, and then connect the D.C. voltmeter in the V2 position, as shown in Fig. G7. A voltmeter in position V1 will measure the volt drop across the rectifier plate. In position V2 it will measure the supply voltage to check that it is the recommended 12 volts on load. Note the battery voltage (should be 12 volt) and then connect the voltmeter in V1 position whilst the following tests are conducted.

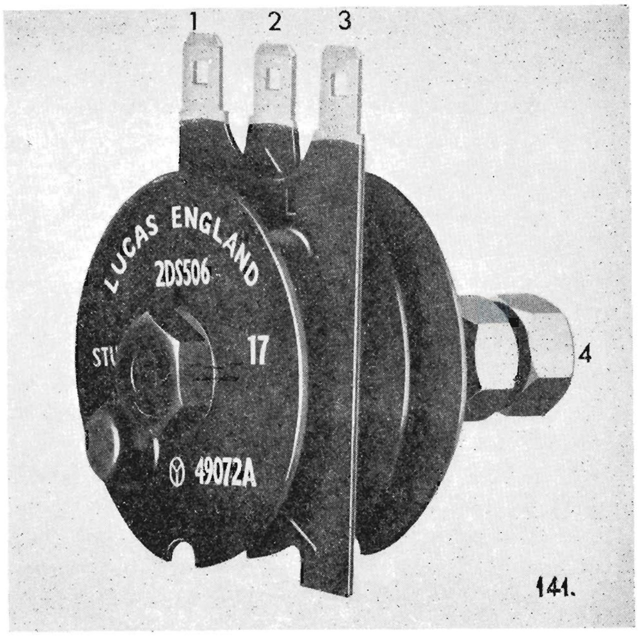


Fig. G6. Rectifier—showing terminal connections for bench tests 1 and 2

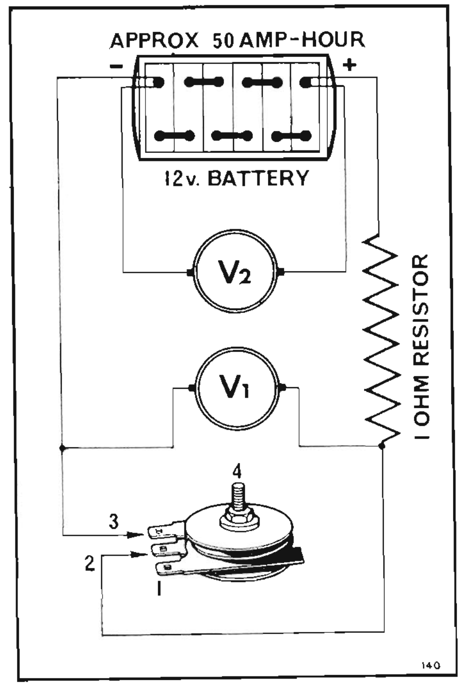


Fig. G7. Bench testing the rectifier

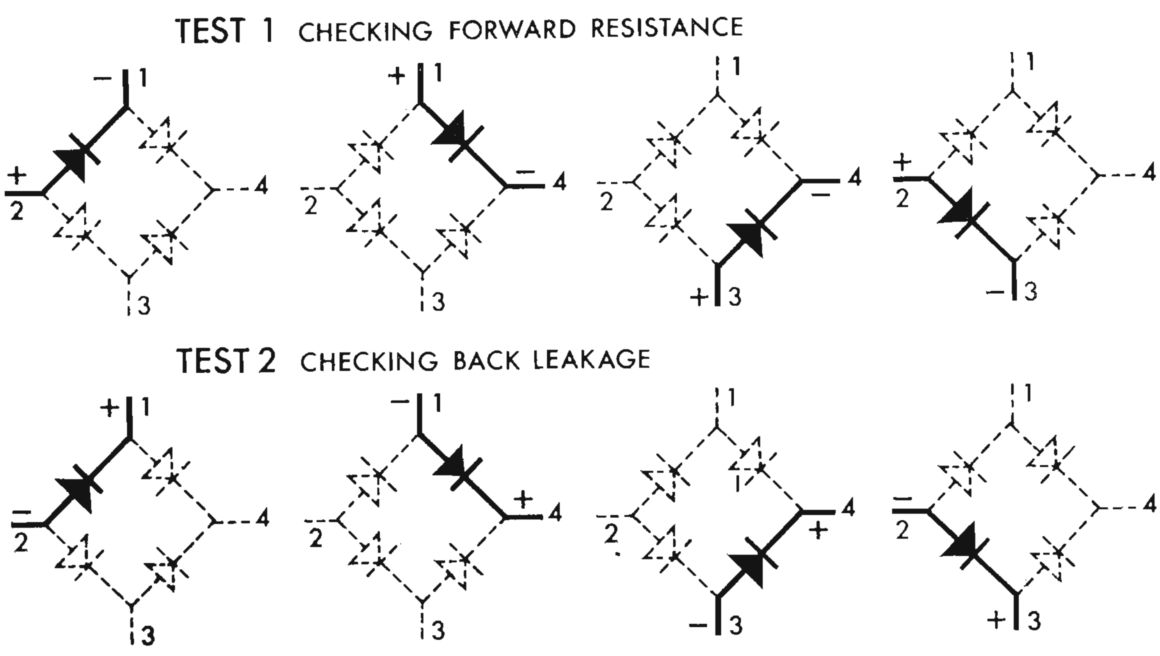


Fig. G8. Rectifier test sequence

In Fig. G8, the rectifier terminal marking 1, 2 and 3 are as shown physically in Figs. G6 and G7, while terminal 4 represents the rectifier center bolt.

1 and 3 are the A.C. input terminals while 2 and 4 are the D.C. output terminals (—ve and +ve respectively)

TEST 1

With the test leads, make the following connections but keep the testing time as short as possible to avoid overheating the rectifier cell: (A) 1 and 2, (B) 1 and 4, (C) 3 and 4, (D) 3 and 2. Each reading should not be greater than 1.5 volts with the battery polarity as shown.

TEST 2

Reverse the leads or battery polarity and repeat Test 1. The reading obtained should be the same as the battery voltage (V2).

If the readings obtained are not within the figures given, then the rectifier internal connections are faulty and the rectifier should be renewed.

PART C

CHECKING THE CHARGING CIRCUIT FOR CONTINUITY

This test utilizes the machine's own battery to test for continuity or breakdown in the A.C. section of the charging system.

The battery must be in a good state of charge and connected correctly into the circuit +ve earth (ground) and the alternator leads must be disconnected at the snap connectors so that there is no possibility of demagnetizing the rotor.

First, check that there is voltage at the rectifier centre terminal by connecting a D.C. voltmeter, with 1 ohm load resistor in parallel, between the rectifier centre terminal and earth, remember (+ve) positive earth (ground). The voltmeter should read dattery volts. If it does not, there is a faulty connection in the wiring.

PART D

CONSTRUCTING A 1 OHM LOAD RESISTOR

The resistor used in the following tests must be accurate and constructed so that it will not overheat otherwise the correct values of current or voltage will not be obtained.

A suitable resistor can be made from 4 yards ($3\frac{3}{4}$ metres) of 18 s.w.g. (·048 in., i.e., 1·2 mm. diameter) Nichrome wire by bending it into two equal parts and calibrating it as follows:—

(1) Fix a heavy gauge flexible lead to the folded end of the wire and connect this lead to the positive terminal of a 6 volt battery.

(2) Connect a D.C. voltmeter (0-10 volts) across the battery terminals and an ammeter (0-10 amp.) between the battery negative terminal and the free ends of the wire resistance, using a crocodile clip to make the connection.

(3) Move the clip along the wires, making contact with both wires until the ammeter reading is numerically equal to the number of volts shown in the voltmeter. The resistance is then 1 ohm. Cut the wire at this point, twist the two ends together and wind the wire on an asbestos former approximately 2 in. (5 cm.) diameter so that each turn does not contact the one next to it.

SECTION G6

ZENER DIODE CHARGE CONTROL

DESCRIPTION

The Zener Diode output regulating system which uses the coils of the alternator connected permanently across the rectifier, provides automatic control of the charging current. It will only operate successfully on a 12 volt system where it is connected in parallel with the battery as shown in the wiring diagram, Fig. G13.

Assuming the battery is in a low state of charge its terminal voltage (the same voltage is across the Diode) will also be low, therefore the maximum charging current will flow into the battery from the alternator. At first none of the current is by-passed by the Diode because of it being non-conducting due to the low battery terminal volts. However, as the battery is quickly restored to a full state of charge, the system voltage rises until at 13.5 volts the Zener Diode becomes partially conducting, thereby providing an alternative path for a small part of the charging current. Small increases in battery voltage result in large increases in Zener conductivity until, at approximately 15 volts about 5 amperes of the alternator output is by-passing the battery. The battery will continue to receive only a portion of the alternator output as long as the system voltage is relatively high.

Depression of the system voltage, due to the use of headlamp or other lighting equipment, causes the Zener Diode current to decrease and the balance to be diverted and consumed by the component in use.

If the electrical loading is sufficient to cause the system voltage to fall to 13·5 volts, the Zener Diode will revert to a high resistance state of non-conductivity and the full generated output will go to meet the demands of the battery.

PART A

MAINTENANCE

The Zener Diode is mounted in the aluminium electrical box beneath the fuel tank. No maintenance will be necessary except to ensure a good firm flat metal to metal contact between the base of the diode and the surface of the heat sink to ensure maximum efficiency. Ensure the earth connection to the Diode is a good one.

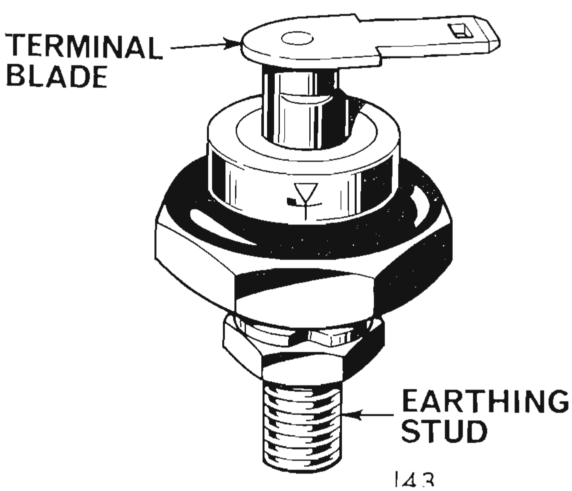


Fig. G9. Zener Diode

The "earthing" stud which secures the Diode to the heat sink, must not be subjected to a tightening torque greater than 22-28 lb./in. The earth wire must be fitted under the fixing nut, **not** between the Diode and heat sink.

CHECKING PERFORMANCE OF ZENER DIODE

The battery should be fully charged before starting. If there is any doubt about the state of charge of the battery, it should be recharged before commencing the test.

Isolate the Zener Diode by disconnecting all leads from the 2MC capacitor.

Connect a D.C. voltmeter Black lead to the straight Lucar with the Brown/Blue cable and the voltmeter Red lead to earth. Connect a D.C. ammeter Red lead to the straight Lucar with the Brown/Blue cable, and the Black lead to the right angle Lucar with a Brown/Blue cable. Check all electrical equipment other than the ignition is switched off. Start the engine and raise r.p.m. to approximately 3,000. Take a careful note of the readings.

As the system voltage rises to 12·75 volts no reading should occur on the ammeter. The voltage will then continue to rise and after 12·75 volts the ammeter should start to read. The next check occurs when the ammeter rises to 2 amps, at this point the voltmeter should read between 13·5 and 15·5 volts.

Conclusions: The Zener Diode must be replaced if:—

(1) Current flow commences before 12·75 V. is reached.

(2) Voltmeter registers more than 15·5 V. before 2 amps is shown on the ammeter.

SECTION G7

ELECTRIC HORN

DESCRIPTION

The horn is of a high frequency single-note type and is operated by direct current from the battery. The method of operation is that of a magnetically operated armature, which impacts on the core face, and causes the tone disc of the horn to vibrate. The magnetic circuit is made self-interrupting by contacts which can be adjusted externally.

If the horn fails to work, check the mounting bolts etc., and horn connection wiring. Check the battery for state of charge. A low supply voltage at the horn will adversely effect horn performance. If the above checks are made and the fault is not remedied, then adjust the horn as follows.

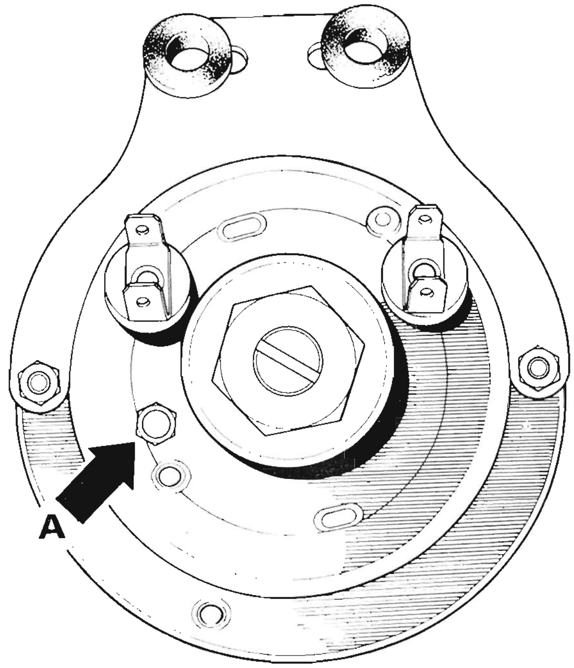


Fig. G10. Electric horn showing adjustment screw

HORN ADJUSTMENT

When adjusting and testing the horn do not depress the horn push for more than a fraction of a second or the circuit wiring may be overloaded.

A small adjustment peg situated near the terminals (see Fig. G10) is provided to take up wear in the internal moving parts of the horn. To adjust, turn this peg anti-clockwise until the horn just fails to sound, and then turn it back (clockwise) about one-quarter to half a turn.

SECTION G8

TAIL AND STOP LAMP UNIT

Access to the bulb in the tail and stop lamp unit is achieved by unscrewing the two slotted screws which secure the lens. The bulb is of the double filament offset pin type and when a replacement is carried out, ensure that the bulb is fitted correctly. Check that the two supply leads are connected correctly and check the earth (ground) lead to the bulb holder is in satisfactory condition.

When refitting the lens, do not over-tighten the fixing screws or the lens may fracture as a result.

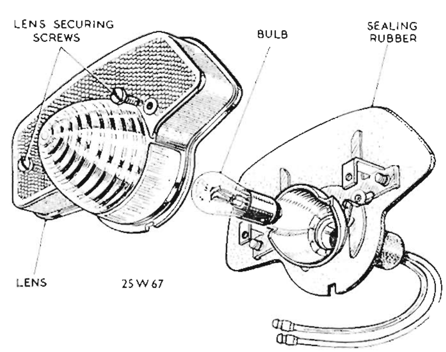


Fig. G11. Stop and tail lamp dismantled

SECTION G9

ALTERNATOR—ADDITIONAL INFORMATION

Specifications and Output Figures

Stator No.	System Voltage	Alternator Output minimum A.C. volts at 3,000 r.p.m.	Stator Coil Details		
		Connect White/Green and Green/Yellow with resistance	No. of Coils	Turns per coil	S.W.G.
47205 (2 lead)	12 volts	8·5	6	140	22

SECTION G10

DIRECTION INDICATOR LAMPS

Access to the bulb is gained by removing the lens which is retained by two screws.

Before fitting a new bulb, check that the earthing clip on the back of the bulb holder is in good contact with the inside of the lamp shell.

Important:—When tightening the pillar locking nut against the lamp shell, it is essential that the torque setting is limited to 35–45 lb. ins. (0·41–0·52 kg. m.).

SECTION G11

IGNITION SWITCH

The 149 S.A. switch incorporates a barrel-type lock using "Yale" type keys and renders the ignition circuit inoperative when turned to the "OFF" position and the key removed.

Check the Lucar connections for good electrical contact and clean if necessary. To remove the ignition switch refer to Section D12.

When removing the ignition switch the battery leads should be disconnected to avoid the possibility of a short circuit.

SECTION G12

OTHER LIGHT UNITS

The headlamp shell contains three warning lights and a parking light, access being gained to each of them by first removing the rim and light unit assembly.

The speedometer light is housed in the base of the speedometer head.

Each bulb holder is a push-fit into its respective component, and the bulbs are located by means of a bayonet fitting except for the speedometer light which has a screw type bulb.

SECTION G13

HEADLAMP

DESCRIPTION

The headlamp is of the pre-focus bulb light unit type containing the hi-beam warning light, oil pressure warning light and a rotary lighting switch. Access is gained to the bulb and bulb holder by withdrawing the rim and light unit assembly. To do this slacken the screw at the top of the headlamp shell just behind and adjacent to the rim and prise off the rim and light unit assembly.

The bulb can be removed by first pressing the cylindrical adapter inwards and turning it anti-clockwise. The adapter can then be withdrawn and the bulb is free to be removed.

When fitting a new bulb, note that it locates by means of a cut-away and projection arrangement.

Also note that the adapter can only be replaced one way, the tabs being staggered to prevent incorrect reassembly. Check the replacement bulb voltage and wattage specification and type before fitting.

Focusing with this type of unit is unnecessary and there is no provision for such.

The speedometer light is housed within the base of the speedometer head.

Each bulb holder is a push-fit into its respective component, and the bulbs are located by means of a peg arrangement, except for the speedometer light which has a screw type bulb.

BEAM ADJUSTMENT

When the motorcycle carries its normal load, the headlamp full-beam should project straight ahead and parallel with the road surface.

To achieve this, place the machine on a level road pointing towards a wall at a distance of 25 feet away, with a rider and passenger, on the machine, slacken the two headlamp fixing bolts at either side and tilt the beam unit until the beam is focused as indicated in Fig. G12. Do not forget that the headlamp should be on "full beam" lighting during this operation. Tighten the bolts fully after adjustment.

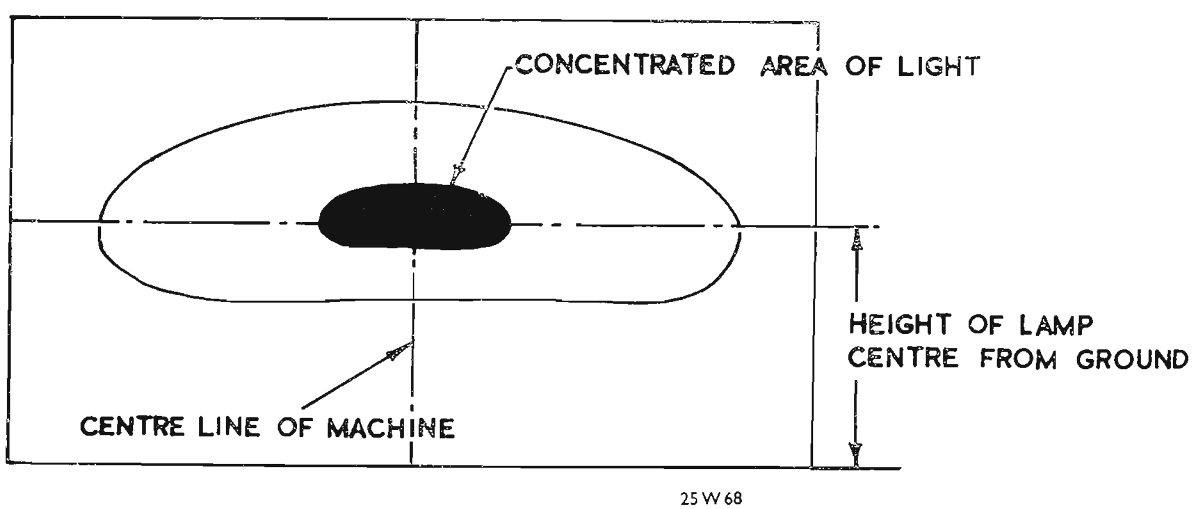


Fig. G12. Beam adjustment

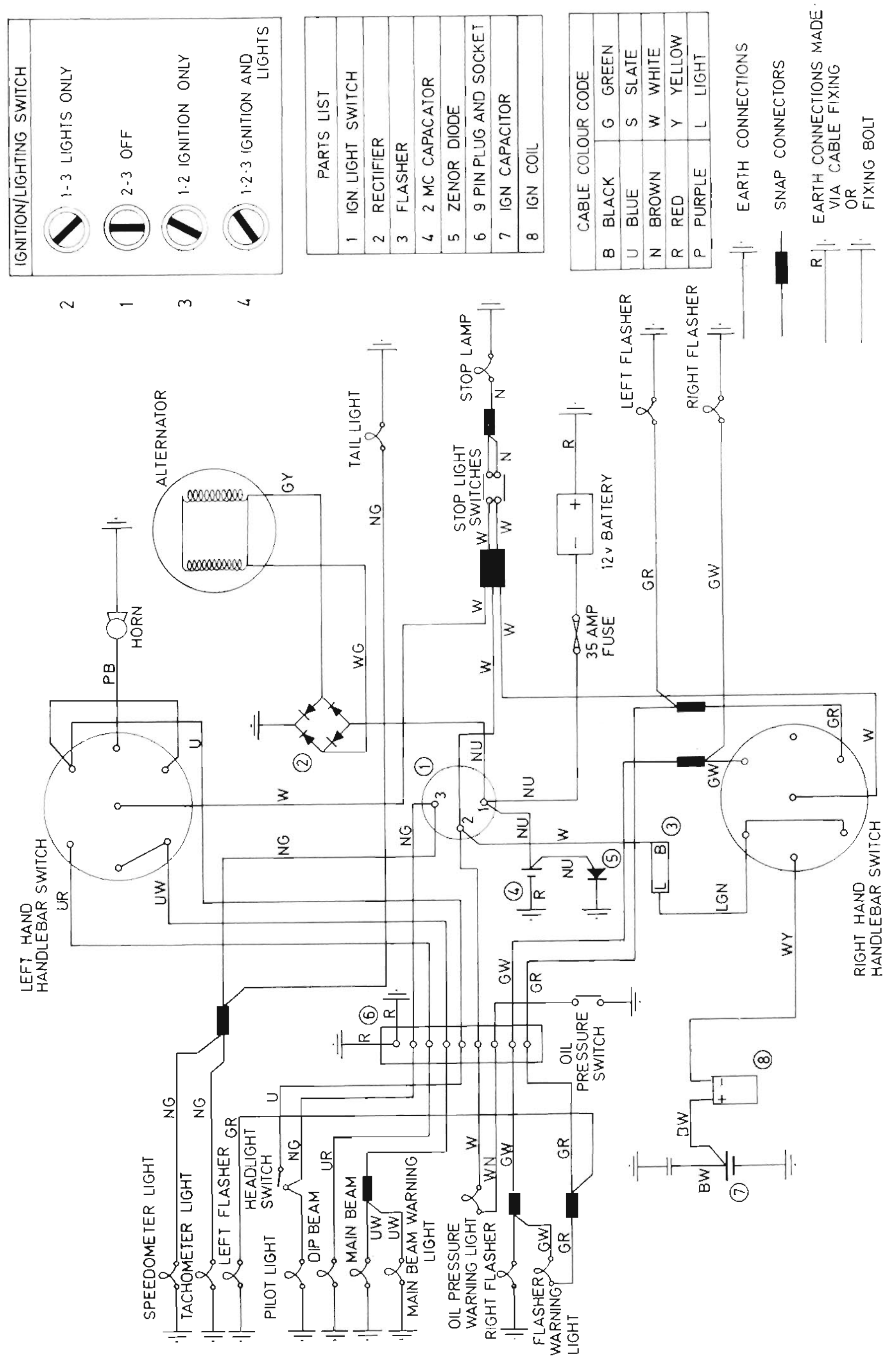


Fig. G13. Wiring diagram

SECTION J

SERVICE TOOLS

INTRODUCTION

This section of the Workshop Manual illustrates pictorially the workshop service tools that are available for carrying out the major dismantling and reassembly operations on the UNIT CONSTRUCTION 250 c.c. TRIUMPH MOTORCYCLE.

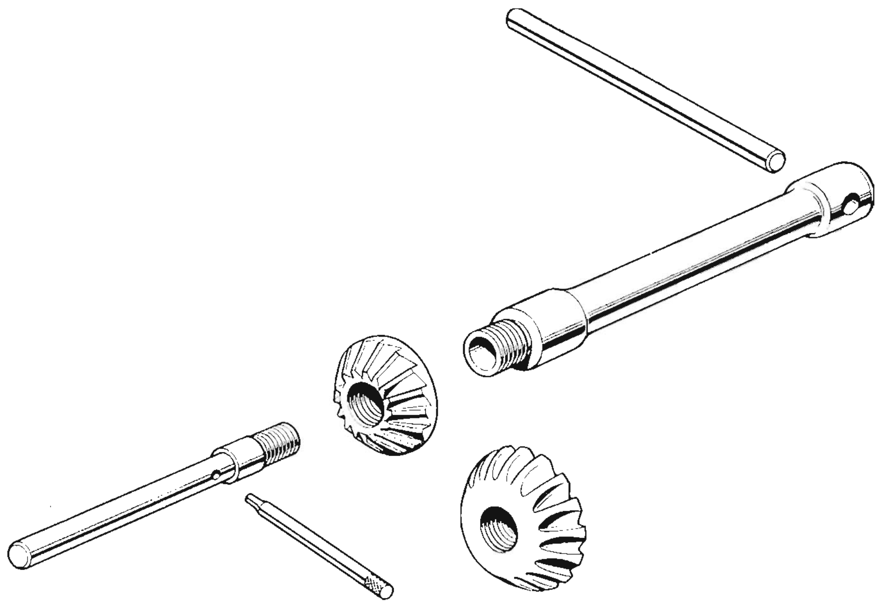


Fig. J1.

Valve seat cutter No. D1832
Blender cutter No. D1835
Arbor, pilot assembly No. D1863

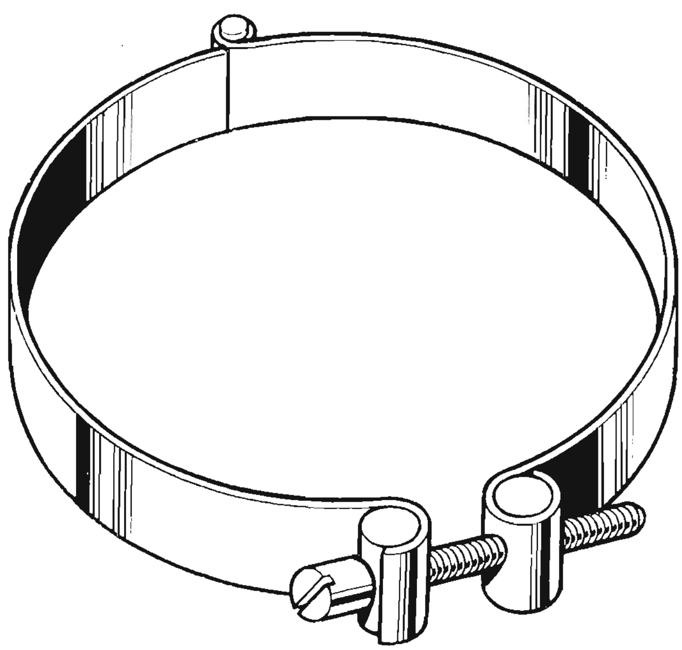


Fig. J2.

Piston ring slipper
No. 61–6031 (65–70 mm.)

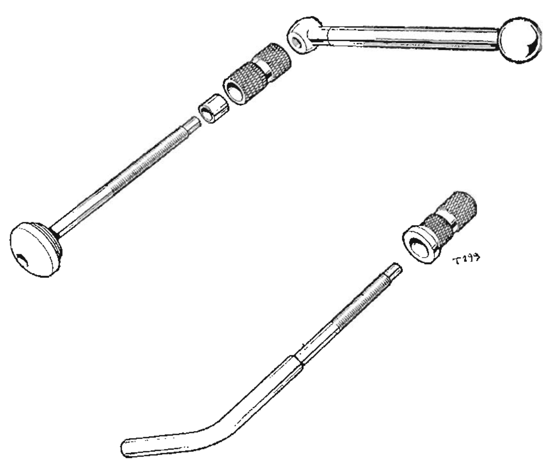


Fig. J3.

Valve guide removal and
replacement tool. No. 61-6063

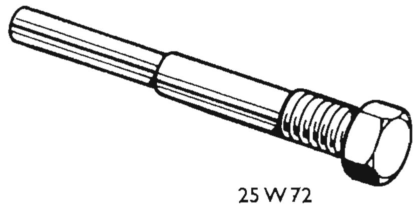


Fig. J4.
Contact breaker cam removal tool
No. 61-3816

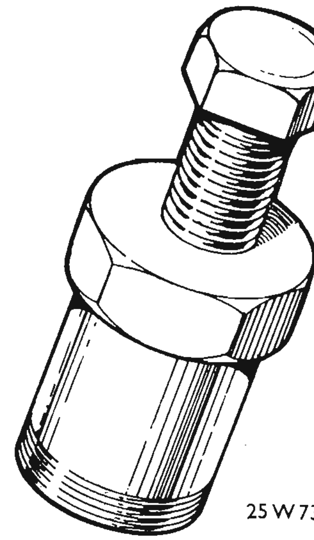


Fig. J6.
Clutch sleeve extractor No. 61-3583

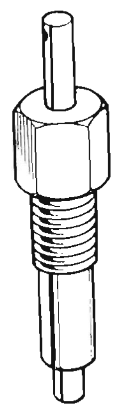


Fig. J5. T.D.C.
locating plunger and body
Nos. D2195/D572

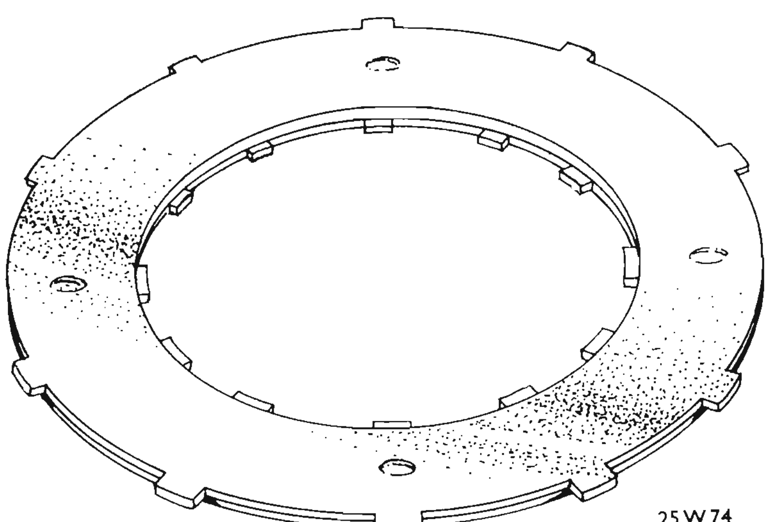


Fig. J7.
Clutch locking tool No. 61-3774

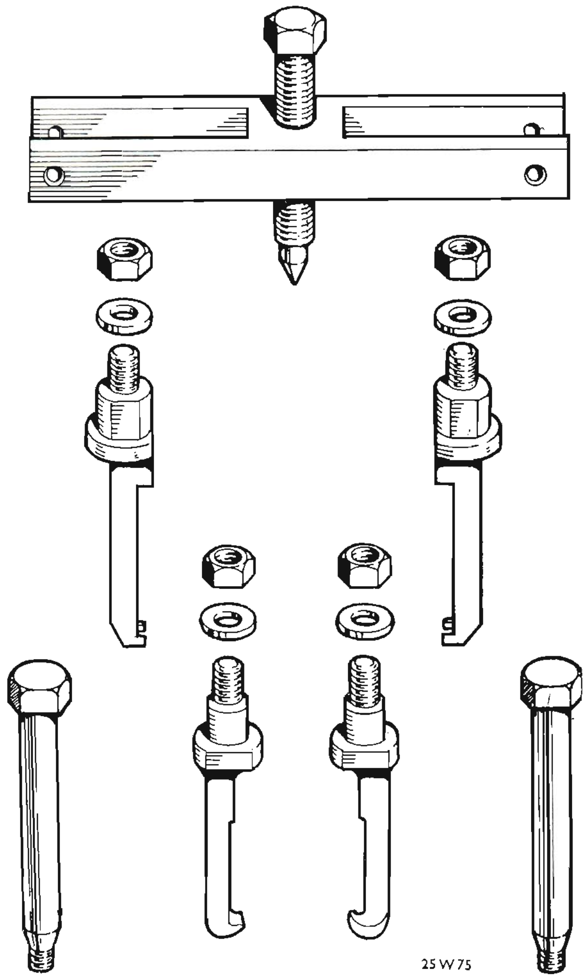


Fig. J8. Pinion extractor set
No. 61–3808

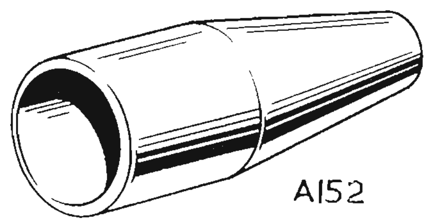


Fig. J10. Contact breaker oil seal spreader
No. Z168

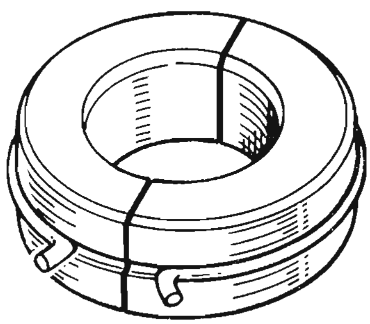

25W76

Fig. J9. Crankshaft balance weight
No. 61–3809

Fig. J11. Crank protection cap No. 61–3819
(For use with extractor No. 61–3808)

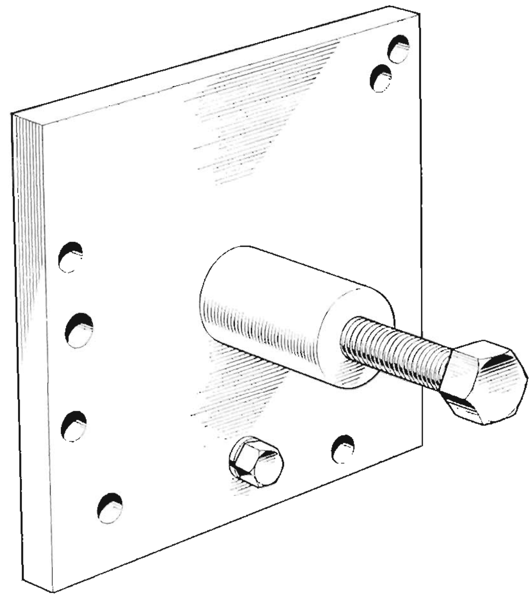


Fig. J12. Crankcase parting tool No. Z165

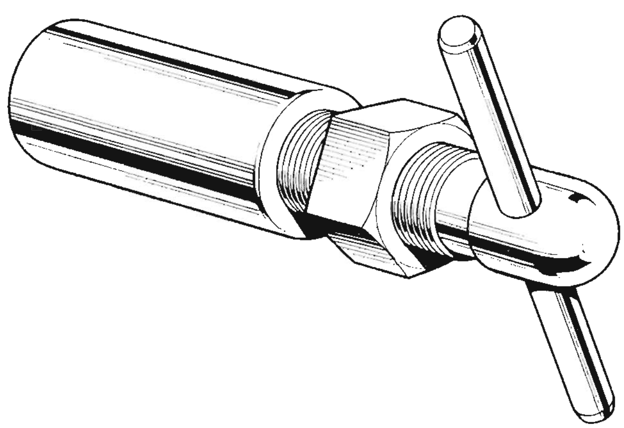


Fig. J13. Crankcase assembly tool No. Z167

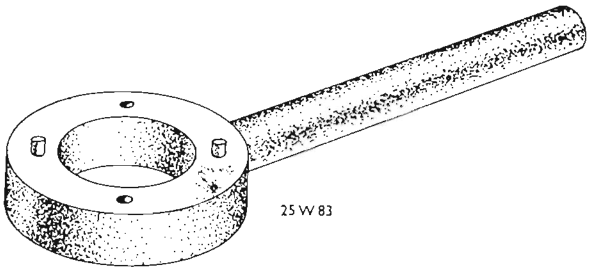


Fig. J14. Wheel bearing retainer peg spanner
No. 61–3694

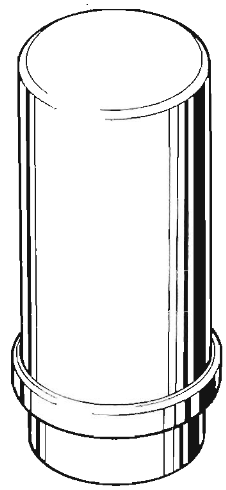


Fig. J15.
Head race bearing drift No. 61-6113

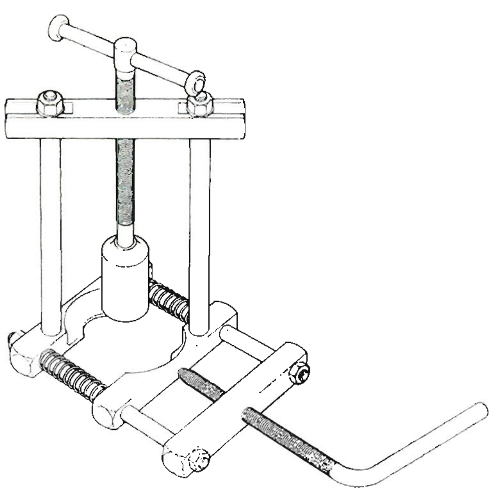


Fig. J17
Crankshaft bearing removal tool No. D3677

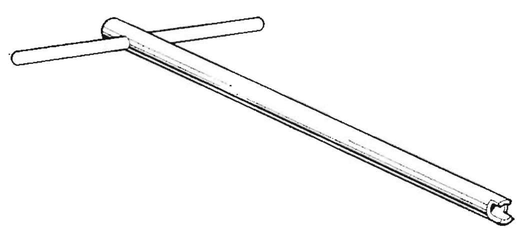


Fig. J16.
Fork damper valve removing tool No. 61-6121

CONVERSION

TABLES

INCHES TO MILLIMETERS—UNITS

Inches	0	10	20	30	40
0		254·0	508·0	762·0	1016.0
1	25·4	279·4	533·4	787·4	1041.4
2	50·8	304·8	558·8	812·8	1066·8
3	76·2	330·2	584·2	838·2	1092·2
4	101·6	355·6	609·6	863·6	1117·6
5	127·0	381·0	635·0	889·0	1143·0
6	152·4	406·4	660·4	914·4	1168·4
7	177·8	431·8	685·8	939·8	1193·8
8	203·2	457·2	711·2	965·2	1219·2
9	228·6	482·6	736·6	990·6	1244·6

One Inch—25·399978 millimetres

One Metre—39·370113 inches

One Mile—1·6093 Km

One Km—·62138 miles

DECIMALS TO MILLIMETRES—FRACTIONS

1/1000	
inches	mm.
·001	·0254
·002	·0508
·003	·0762
·004	·1016
·005	·1270
·006	·1524
·007	·1778
·008	·2032
·009	·2286

1/100	
inches	mm.
·01	·254
·02	·508
·03	·726
·04	1·016
·05	1·270
·06	1·524
·07	1·778
·08	2·032
·09	2·286

1/10	
inches	mm.
·1	2·54
·2	5·08
·3	7·62
·4	10·16
·5	12·70
·6	15·24
·7	17·78
·8	20·32
·9	22.86

FRACTIONS TO DECIMALS AND MILLIMETRES

Fractions			Decimals	mm.
		1/64	·015625	·3969
	1/32		·03125	·7937
		3/64	·046875	1·1906
1/16			·0625	1·5875
		5/64	·078125	1·9844
	3/32		·09375	2·3812
		7/64	·109375	2·7781
1/8			·125	3·1750
		9/64	·140625	3·5719
	5/32		·15625	3·9687
		11/64	·171875	4·3656
3/16			·1875	4·7625
		13/64	·203125	5·1594
	7/32		·21875	5·5562
		15/64	·234375	5·9531
1/4			·25	6·3500
		17/64	·265625	6·7469
	9/32		·28125	7·1437
		19/64	·296875	7·5406
5/16			·3125	7·9375
		21/64	·328125	8·3344
	11/32		·34375	8·7312
		23/64	·359375	9·1281
3/8			·375	9·5250
		25/64	·390625	9·9219
	13/32		·40625	10·3187
		27/64	·421875	10·7156
7/16			·4375	11·1125
		29/64	·453125	11·5094
	15/32		·46875	11·9062
		31/64	·484375	12·3031
1/2			·5	12·7000

Fractions			Decimals	mm.
		33/64	·515625	13·0969
	17/32		·53125	13·4937
		35/64	·546675	13·8906
9/16			·5625	14·2875
		37/64	·578125	14·6844
	19/32		·59375	15·0812
		39/64	·609375	15·4781
5/8			·625	15·8750
		41/64	·640625	16·2719
	21/32		·65685	16·6687
		43/64	·671875	17·0656
11/16			·6875	17·4625
		45/64	·703125	17·8594
	23/32		·71875	18·2562
		47/64	·734375	18·6531
3/4			·75	19·0500
		49/64	·765625	19·4469
	25/32		·78125	19·8437
		51/64	·796875	20·2406
13/16			·8125	20·6375
		53/64	·828125	21·0344
	27/32		·84375	21·4312
		55/64	·859375	21·8281
7/8			·875	22·2250
		57/64	·890625	22·6219
	29/32		·90625	23·0187
		59/64	·921875	23·4156
15/16			·9375	23·8125
		61/64	·953125	24·2094
	31/32		·96875	24·6062
		63/64	·984375	25·0031
1				25·4000

MILLIMETRES TO INCHES—UNITS

mm.	0	10	20	30	40
0		·39370	·78740	1·18110	1·57480
1	·03937	·43307	·82677	1·22047	1·61417
2	·07874	·47244	·86614	1·25984	1·65354
3	·11811	·51181	·90551	1·29921	1·69291
4	·15748	·55118	·94488	1·33858	1·73228
5	·19685	·59055	·98425	1·37795	1·77165
6	·23622	·62992	1·02362	1·41732	1·81103
7	·27559	·66929	1·06299	1·45669	1·85040
8	·31496	·70866	1·10236	1·49606	1·88977
9	·35433	·74803	1·14173	1·53543	1·92914

mm.	50	60	70	80	90
0	1·96851	2·36221	2·75591	3·14961	3·54331
1	2·00788	2·40158	2·79528	3·18891	3·58268
2	2·04725	2·44095	2·83465	3·22835	3·62205
3	2·08662	2·48032	2·87402	3·26772	3·66142
4	2·12599	2·51969	2·91339	3·30709	3·70079
5	2·16536	2·55906	2·95276	3·34646	3·74016
6	2·20473	2·59843	2·99213	3·38583	3·77953
7	2·24410	2·63780	3·03150	3·42520	3·81890
8	2·28347	2·67717	3·07087	3·46457	3·85827
9	2·32284	2·71654	3·11024	3·50394	3·89764

MILLIMETRES TO INCHES—FRACTIONS

1/1000	
mm.	inches
0·001	·000039
0·002	·000079
0·003	·000118
0·004	·000157
0·005	·000197
0·006	·000236
0·007	·000276
0·008	·000315
0·009	·000354

1/100	
mm.	inches
0·01	·00039
0·02	·00079
0·03	·00118
0·04	·00157
0·05	·00197
0·06	·00236
0·07	·00276
0·08	·00315
0·09	·00354

1/10	
mm.	inches
0·1	·00394
0·2	·00787
0·3	·01181
0·4	·01575
0·5	·01969
0·6	·02362
0·7	·02756
0·8	·03150
0·9	·03543

DRILL SIZES

Letter	Size	Letter	Size
A	·234	N	·302
B	·238	O	·316
C	·242	P	·323
D	·246	Q	·332
E	·250	R	·339
F	·257	S	·348
G	·261	T	·358
H	·266	U	·368
I	·272	V	·377
J	·277	W	·386
K	·281	X	·397
L	·290	Y	·404
M	·295	Z	·413

Number	Size	Number	Size	Number	Size	Number	Size
1	·2280	14	·1820	27	·1440	40	·0980
2	·2210	15	·1800	28	·1405	41	·0960
3	·2130	16	·1770	29	·1360	42	·0935
4	·2090	17	·1730	30	·1285	43	·0890
5	·2055	18	·1695	31	·1200	44	·0860
6	·2040	19	·1660	32	·1160	45	·0820
7	·2010	20	·1610	33	·1130	46	·0810
8	·1990	21	·1590	34	·1110	47	·0785
9	·1960	22	·1570	35	·1100	48	·0760
10	·1935	23	·1540	36	·1065	49	·0730
11	·1910	24	·1520	37	·1040	50	·0700
12	·1890	25	·1495	38	·1015	51	·0670
13	·1850	26	·1470	39	·0995	52	·0635

WIRE GAUGES

No. of Gauge	Imperial Standard Wire Gauge		Brown and Sharpe's American Wire Gauge	
	Inches	millimetres	Inches	millimetres
0000	·400	10·160	·460	11·684
000	·372	9·448	·410	10·404
00	·348	8·839	·365	9·265
0	·324	8·299	·325	8·251
1	·300	7·620	·289	7·348
2	·276	7·010	·258	6·543
3	·252	6·400	·229	5·827
4	·232	5·892	·204	5·189
5	·212	5·384	·182	4·621
6	·192	4·676	·162	4·115
7	·176	4·470	·144	3·664
8	·160	4·064	·128	3·263
9	·144	3·657	·114	2·906
10	·128	3·251	·102	2·588
11	·116	2·946	·091	2·304
12	·104	2·641	·081	2·052
13	·092	2·336	·072	1·827
14	·080	2·032	·064	1·627
15	·072	1·828	·057	1·449
16	·064	1·625	·051	1·290
17	·056	1·422	·045	1·149
18	·048	1·219	·040	1·009
19	·040	1·016	·035	·911
20	·036	·914	·032	·811
21	·032	·812	·028	·722
22	·028	·711	·025	·643
23	·024	·609	·023	·573
24	·022	·558	·020	·511
25	·020	·508	·018	·454
26	·018	·457	·016	·404
27	·0164	·416	·014	·360
28	·0148	·375	·012	·321
29	·0136	·345	·011	·285
30	·0124	·314	·010	·254

B.S.W. SCREW THREADS

Dia. of bolt (inch)	Threads per inch	Dia. tap drill (inch)	Core dia.	Area at thd. root sq. in.	PITCH DIAMETER Nut max.	Nut min.	Bolt max.	Bolt min.	HEX. Flats (mean)	Corners	Nut thickness (·005)
1/4	20	·1968	·1860	·0272	·2245	·2200	·2180	·2135	·522	·61	·245
5/16	18	1/4	·2412	·0458	·2836	·2789	·2769	·2722	·597	·69	·307
3/8	16	5/16	·2950	·0683	·3420	·3370	·3350	·3300	·707	·82	·370
7/16	14	23/64	·3460	·0940	·3991	·3938	·3918	·3865	·817	·95	·432
1/2	12	13/32	·3933	·1215	·4544	·4486	·4466	·4408	·917	1·06	·495
9/16	12	15/32	·4558	·1632	·5169	·5111	·5091	·5033	1·006	1·17	·557
5/8	11	17/32	·5086	·2032	·5748	·5688	·5668	·5608	1·096	1·27	·620
11/16	11	37/64	·5711	·2562		·6313	·6293		·1196	1·39	·682
3/4	10	41/64	·6219	·3038	·6943	·6880	·6860	·6797	1·296	1·50	·745
13/16	10	45/64	·6844	·3679		·7506	·7485				
7/8	9	3/4	·7327	·4216	·8126	·8059	·8039	·7972	1·474	1·71	·870
15/16	9	13/16	·7952	·4966		·8684	·8664				
1	8	55/64	·8399	·5540	·9291	·9220	·9200	·9129	1·664	1·93	·995

B.S.F. SCREW THREADS

Dia. of bolt (inch)	Threads per inch	Dia. tap drill (inch)	Core dia.	Area at thd. root sq. in.	PITCH DIAMETER Nut max.	Nut min.	Bolt max.	Bolt min.	HEX. Flats (mean)	Corners	Nut thickness (mean)
7/32	28	·1770	·1731	·0235	·2018	·1980	·1960	·1922	·412	·48	·166
1/4	26	·2055	·2007	·0316	·2313	·2274	·2254	·2215	·442	·51	·195
9/32	26	·238	·2320	·0423	·2625	·0586	·2565	·2527			
5/16	22	·261	·2543	·0508	·2897	·2854	·2834	·2791	·522	·61	·245
3/8	20	·316	·3110	·0760	·3495	·3450	·3430	·3385	·597	·69	·307
7/16	18	3/8	·3664	·1054	·4086	·4039	·4019	·3372	·707	·82	·370
1/2	16	27/64	·4200	·1385	·4670	·4620	·4600	·4550	·817	·95	·432
9/16	16	·492	·4825	·1828	·5295	·5245	·5225	·5175	·917	1·06	·495
5/8	14	35/64	·5335	·2235	·5866	·5813	·5793	·5740	1·006	1·17	·557
11/16	14	39/64	·5960	·2790	·6491	·6438	·6418	·6365	1·096	1·27	·620
3/4	12	21/32	·6433	·3250	·7044	·6986	·6966	·6908	1·196	1·39	·682
13/16	12	23/32	·7058	·3913	·7669	·7611	·7591	·7533			
7/8	11	25/32	·7586	·4520	·8248	·8188	·8168	·8108	1·296	1·50	·745
1	10	57/64	·8719	·5971	·9443	·9380	·9360	·9297	1·474	1·71	·870
1-1/8	9	1	·9827	·7585	1·0626	1·0559	1·0539	1·0472	1·664	1·98	·995
1-1/4	9	1-1/8	1·1077	·9637	1·1876	1·1809	1·7819	1·1722	1·852	2·15	1·115
1-3/8	8	1-15/64	1·2149	·1593	1·3041	1·2970	1·2950	1·2879	2·042	2·37	1·240
1-1/2	8	1·358	1·3399	·4100	1·4291	1·4220	1·4200	1·4129	2·210	2·56	1·365
1-5/8	8	1-31/64	1·4649	1·6854	1·5541	1·5470	1·5450	1·5379	2·400	2·78	1·400

B.S.C. SCREW THREADS

Dia. of bolt (inch)	THDS. PER INCH		Pitch (inch)	Depth of thread (inch)	BASIC DIAMETERS (Inch)		
	Normal series	20 T.P.I. series			Major	Effective	Minor
1/8	40		0·02500	0·0133	·01250	0·1117	0·0984
5/32	32		0·03125	0·0166	0·1563	0·1397	0·1231
3/16	32		0·03125	0·0166	0·1875	0·1709	0·1543
7/32	26		0·03846	0·0205	0·2188	0·1983	0·1778
1/4	26		0·03846	0·0205	0·2500	0·2295	0·2090
9/32	26		0·03846	0·0205	0·2813	0·2608	0·2403
5/16	26		0·03846	0·0205	0·3125	0·2920	0·2715
3/8	26		0·03846	0·0205	0·3750	0·3545	0·3340
7/16	26		0·03846	0·0205	0·4375	0·4170	0·3965
		20	0·05000	0·0266	0·4375	0·4109	0·3843
1/2	26		0·03846	0·0205	0·5000	0·4795	0·4590
		20	0·05000	0·0266	0·5000	0·4734	0·4468
9/16	26		0·03846	0·0205	0·5625	0·5420	0·5215
		20	0·05000	0·0266	0·5625	0·5359	0·5093
5/8	26		0·03846	0·0205	0·6250	0·6045	0·5840
		20	0·05000	0·0266	0·6250	0·5984	0·5718
11/16	26		0·03846	0·0205	0·6875	0·6670	0·6465
		20	0·05000	0·0266	0·6875	0·6609	0·6343
3/4	26		0·03846	0·0205	0·7500	0·7295	0·7090
		20	0·05000	0·0266	0·7500	0·7234	0·6968

B.A. SCREW THREADS

No.	Dia. of bolt	Thds. per inch	Dia. tap drill	Core dia.	Area at thd. root sq. in.	PITCH DIAMETER Nut		PITCH DIAMETER Bolt		HEX.		Nut thickness
						max.	min.	max.	min.	Flats	Corners	
0	·2362	25·4	·1960	·1890	·0281	·2165	·2126	·2126	·2087	·413	·47	·236
1	·2087	28·2	·1770	·1661	·0217	·1908	·1875	·1873	·1838	·365	·43	·209
2	·1850	31·4	·1520	·1468	·0169	·1693	·1659	·1659	·1626	·324	·37	·185
3	·1614	34·8	·1360	·1269	·0126	·1472	·1441	·1441	·1409	·282	·33	·161
4	·1417	38·5	·1160	·1106	·0096	·1290	·1261	·1261	·1231	·248	·29	·142
5	·1260	43·0	·1040	·0981	·0075	·1147	·1119	·1119	·1091	·220	·25	·126
6	·1102	47·9	·0935	·0852	·0057	·1000	·0976	·0976	·0953	·193	·22	·110
7	·0984	52·9	·0810	·0738	·0045	·0893	·0869	·0869	·0845	·172	·20	·098
8	·0866	59·1	·0730	·0663	·0034	·0785	·0764	·0764	·0742	·152	·18	·087
9	·0748	65·1	·0635	·0564	·0025	·0675	·0656	·0656	·0636	·131	·15	·075
10	·0669	72·6	·0550	·0504	·0021		·0587	·0587		·117	·14	·067
11	·0591	81·9	·0465	·0445	·0016					·103	·12	·059
12	·0511	90·9	·0400	·0378	·0011					·090	·10	·051
13	·0472	102·0	·0360	·0352	·0010					·083	·09	·047
14	·0394	109·9	·0292	·0280	·0006					·069	·08	·029
15	·0354	120·5	·0260	·0250	·0005					·061	·07	·035
16	·0311	133·3	·0225	·0220	·0004							

FOOT POUNDS TO KILOGRAMETRES

	0	1	2	3	4	5	6	7	8	9	
—		0·138	0·277	0·415	0·553	0·691	0·830	0·968	1·106	1·244	—
10	1·383	1·521	1·659	1·797	1·936	2·074	2·212	2·350	2·489	2·627	10
20	2·765	2·903	3·042	3·180	3·318	3·456	3·595	3·733	3·871	4·009	20
30	4·148	4·286	4·424	4·562	4·701	4·839	4·977	5·116	5·254	5·392	30
40	5·530	5·668	5·807	5·945	6·083	6·221	6·360	6·498	6·636	6·774	40
50	6·913	7·051	7·189	7·328	7·466	7·604	7·742	7·881	8·019	8·157	50
60	8·295	8·434	8·572	8·710	8·848	8·987	9·125	9·263	9·401	9·540	60
70	9·678	9·816	9·954	10·093	10·231	10·369	10·507	10·646	10·784	10·922	70
80	11·060	11·199	11·337	11·475	11·613	11·752	11·890	12·028	12·166	12·305	80
90	12·443	12·581	12·719	12·858	12·996	13·134	13·272	13·411	13·549	13·687	90

MILES TO KILOMETRES

	0	1	2	3	4	5	6	7	8	9	
—		1·609	3·219	4·828	6·437	8·047	9·656	11·265	12·875	14·484	—
10	16·093	17·703	19·312	20·922	22·531	24·140	25·750	27·359	28·968	30·578	10
20	32·187	33·796	35·406	37·015	38·624	40·234	41·843	43·452	45·062	46·671	20
30	48·280	49·890	51·499	53·108	54·718	56·327	57·936	59·546	61·155	62·765	30
40	64·374	65·983	67·593	69·202	70·811	72·421	74·030	75·639	77·249	78·858	40
50	80·467	82·077	83·686	85·295	86·905	88·514	90·123	91·733	93·342	94·951	50
60	96·561	98·170	99·780	101·389	102·998	104·608	106·217	107·826	109·436	111·045	60
70	112·654	114·264	115·873	117·482	119·092	120·701	122·310	123·920	125·529	127·138	70
80	128·748	130·357	131·967	133·576	135·185	136·795	138·404	140·013	141·623	143·232	80
90	144·841	146·451	148·060	149·669	151·279	152·888	154·497	156·107	157·716	159·325	90

POUNDS TO KILOGRAMS

	0	1	2	3	4	5	6	7	8	9	
—		0·454	0·907	1·361	1·814	2·268	2·722	3·175	3·629	4·082	—
10	4·536	4·990	5·443	5·897	6·350	6·804	7·257	7·711	8·165	8·618	10
20	9·072	9·525	9·079	10·433	10·886	11·340	11·793	12·247	12·701	13·154	20
30	13·608	14·061	14·515	14·968	15·422	15·876	16·329	16·783	17·237	17·690	30
40	18·144	18·597	19·051	19·504	19·958	20·412	20·865	21·319	21·772	22·226	40
50	22·680	23·133	23·587	24·040	24·494	24·948	25·401	25·855	26·308	26·762	50
60	27·216	27·669	28·123	28·576	29·030	29·484	29·937	30·391	30·844	31·298	60
70	31·751	32·205	32·659	33·112	33·566	34·019	34·473	34·927	35·380	35·834	70
80	36·287	36·741	37·195	37·648	38·102	38·855	39·009	39·463	39·916	40·370	80
90	40·823	41·277	41·731	42·184	42·638	43·091	43·545	43·998	44·452	44·906	90

MILES PER GALLON (IMPERIAL) TO LITRES PER 100 KILOMETRES

10	28·20	15	18·83	20	14·12	25	11·30	30	9·42	35	8·07	40	7·06
10½	26·95	15½	18·22	20½	13·78	25½	11·08	30½	9·26	35½	7·96	41	6·89
11	25·68	16	17·66	21	13·45	26	10·87	31	9·11	36	7·85	42	6·73
11½	24·56	16½	17·12	21½	13·14	26½	10·66	31½	8·97	36½	7·74	43	6·57
12	23·54	17	16·61	22	12·84	27	10·46	32	8·83	37	7·63	44	6·42
12½	22·60	17½	16·14	22½	12·55	27½	10·27	32½	8·69	37½	7·53	45	6·28
13	21·73	18	15·69	23	12·28	28	10·09	33	8·56	38	7·43	46	6·14
13½	20·92	18½	15·27	23½	12·02	28½	9·91	33½	8·43	38½	7·34	47	6·01
14	20·18	19	14·87	24	11·77	29	9·74	34	8·31	39	7·24	48	5·89
14½	19·48	19½	14·49	24½	11·53	29½	9·58	34½	8·19	39½	7·15	49	5·77

50	5·65	60	4·71	70	4·04
51	5·54	61	4·63	71	3·98
52	5·43	62	4·55	72	3·92
53	5·33	63	4·48	73	3·87
54	5·23	64	4·41	74	3·82
55	5·13	65	4·35	75	3·77
56	5·04	66	4·28	76	3·72
57	4·96	67	4·22	77	3·67
58	4·87	68	4·16	78	3·62
59	4·79	69	4·10	79	3·57

PINTS TO LITRES

	0	1	2	3	4	5	6	7	8
—	—	·568	1·136	1·705	2·273	2·841	3·841	3·978	4·546
$\frac{1}{4}$	·142	·710	1·279	1·846	2·415	2·983	3·552	4·120	4·688
$\frac{1}{2}$	·284	·852	1·420	1·989	2·557	3·125	3·125	4·6F4	4·830
$\frac{3}{4}$	·426	·994	1·563	2·131	2·699	3·267	3·836	4·404	4·972

GALLONS (IMPERIAL) TO LITRES

	0	1	2	3	4	5	6	7	8	9	
—		4·546	9·092	13·638	18·184	22·730	27·276	31·822	36·368	40·914	—
10	45·460	50·005	54·551	59·097	63·643	63·189	72·735	77·281	81·827	86·373	10
20	90·919	95·465	100·011	104·557	000·000	113·649	118·195	122·741	127·287	131·833	20
30	136·379	140·924	145·470	150·016	000·000	159·108	163·645	168·200	172·746	177·292	30
40	181·838	186·384	190·930	195·476	200·022	204·568	209·114	213·660	218·206	222·752	40
50	227·298	231·843	236·389	240·935	245·481	250·027	254·573	259·119	263·605	268·211	50
60	272·757	277·303	281·849	286·395	290·941	295·487	300·033	304·579	309·125	313·671	60
70	318·217	322·762	327·308	331·854	336·400	340·946	345·492	350·038	354·584	359·130	70
80	363·676	368·222	372·768	377·314	381·860	386·406	390·952	395·498	400·044	404·590	80
90	409·136	413·681	418·227	422·773	427·319	431·865	436·411	440·957	445·503	450·049	90

POUNDS PER SQUARE INCH TO KILOGRAMS PER SQUARE CENTIMETRE

	0	1	2	3	4	5	6	7	8	9	
—		0·070	0·141	0·211	0·281	0·352	0·422	0·492	0·562	0·633	—
10	0·703	0·773	0·844	0·914	0·984	1·055	1·125	1·195	1·266	1·336	10
20	1·406	1·476	1·547	1·617	1·687	1·758	1·828	1·898	1·969	2·039	20
30	2·109	2·179	2·250	2·320	2·390	2·461	2·531	2·601	2·672	2·742	30
40	2·812	2·883	2·953	3·023	3·093	3·164	3·234	3·304	3·375	3·445	40
50	3·515	3·586	3·656	3·726	3·797	3·867	3·937	4·007	4·078	4·148	50
60	4·218	4·289	4·359	4·429	4·500	4·570	4·640	4·711	4·781	4·851	60
70	4·921	4·992	5·062	5·132	5·203	5·273	5·343	5·414	5·484	5·554	70
80	5·624	5·695	5·765	5·835	5·906	5·976	6·046	6·117	6·187	6·257	80
90	6·328	6·398	6·468	6·538	6·609	6·679	6·749	6·820	6·890	6·960	90

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