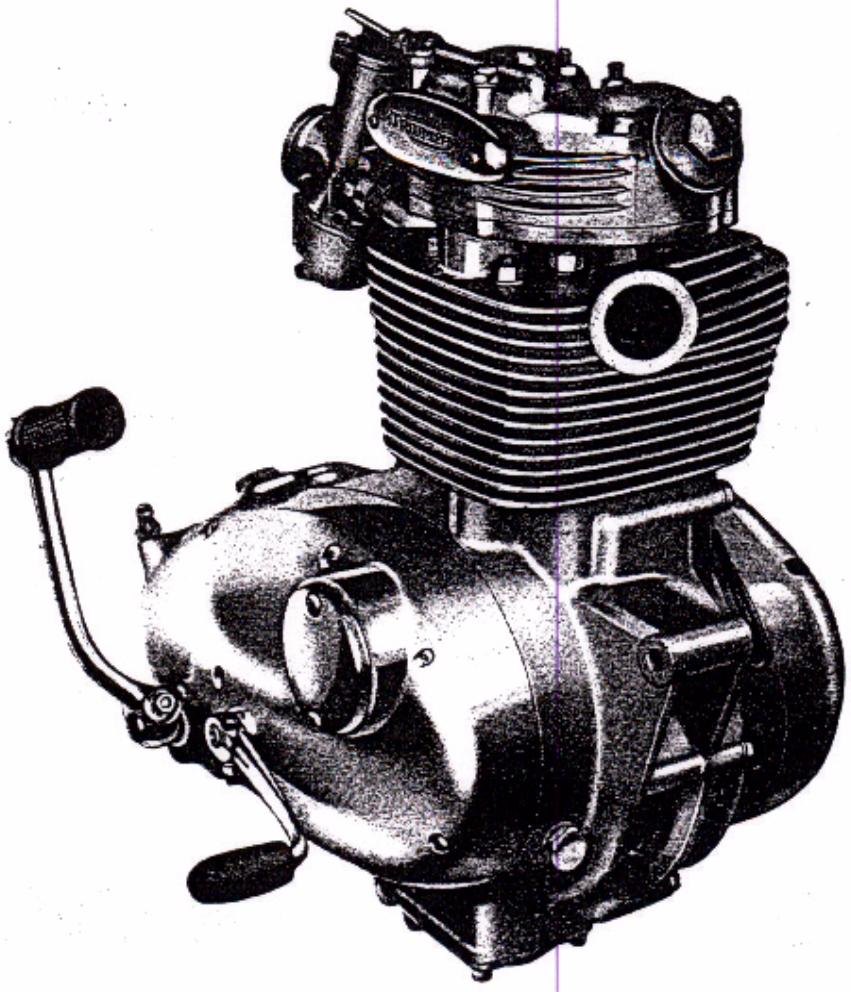
TRIUMPH

WORKSHOP MANUAL



UNIT CONSTRUCTION 250 c.c.
(15 cu. ins.)
SINGLE CYLINDER
TR25W

REF. WSM 3.

1969

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 TR25W.

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 sub-divided 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 hand side of the engine immediately below the cylinder barrel to crankcase flange. The engine type is incorporated as a prefix to the engine number.

The frame number of the machine is stamped on the left side of the frame, on the side of the front engine mounting lug.

Both the engine and frame numbers should be given IN FULL in any correspondence relating to the machine either with your local Triumph Dealer or the Distributor (or in the United Kingdom with the Triumph Service Department).

GUARANTEE

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

EASTERN U.S.A. DISTRIBUTORS

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

WESTERN U.S.A. DISTRIBUTORS

JOHNSON MOTORS INC.,
P.O. BOX 2765,
EAST HUNTINGTON DRIVE,
DUARTE,
CALIFORNIA 91010.

IMPORTANT NOTE

The fitting of components which are not approved by the manufacturer invalidates the guarantee.

FACTORY SERVICE ARRANGEMENTS

UNITED KINGDOM ONLY

CORRESPONDENCE

Technical Advice, Guarantee Claims and Repairs

Communications dealing with any 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 until the Dealer has inspected them. 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 owner's name and address should be enclosed together with full instructions. In the case of complete motorcycles, a label showing the owner'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.

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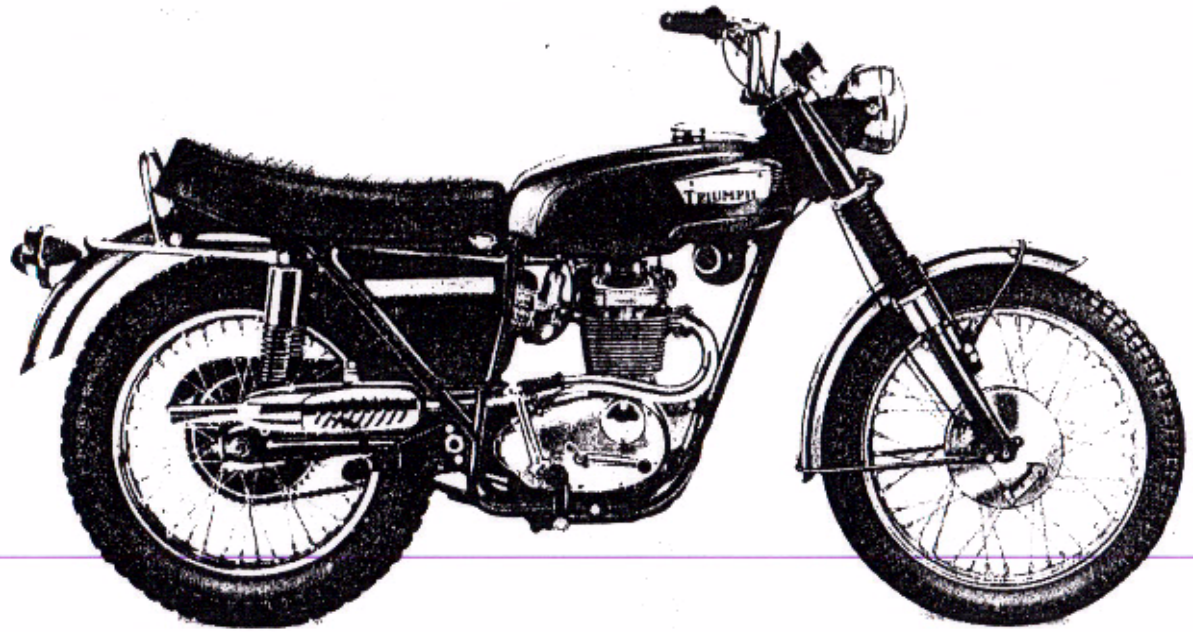

TRIUMPH 250 c.c. TROPHY TR25W

GENERAL DATA

TR25W TROPHY 250

250cc. (15 cu. ins.)

ENGINE

PISTON	
Material	"Lo-Ex" aluminium
Compression ratio	10 : 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)	Brico BSS.5004
Material—compression (centre)	Brico 8
Material—scraper	Brico BSS.5004
Width—compression (top and centre)	·0625 in. (1·5875 mm.)
Width—scraper	·125 in. (3·175 mm.)
Depth—compression (top and centre)	·108/·114 in. (2·7432/2·8956 mm.)
Depth—scraper	·094/·100 in. (2·3876/2·540 mm.)
Clearance in groove	·001/·003 in. (·0254/·0762 mm.)
Fitted gap—(maximum)	·013 in. (·3302 mm.)
Fitted gap—(maximum)	·009 in. (·2283 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.)
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. (46·8376 mm.)
Cylinder head inteference fit	·0015/·0025 in. (·0381/·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 with austenitic iron liner
Bore size (standard)	67 mm.
Stroke	70 mm.
Oversizes	½ mm. and 1 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 928/1 (concentric float chamber)
Main jet	170
Needle jet size	·106 in. (2·69 mm.)
Needle position	1
Throttle valve	3
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/·0015 in. (·0127/·0381 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.)

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

	With 52T gearbox sprocket	With 49T gearbox sprocket
Overall—top	7·386	7·838
—third	9·189	9·752
—second	12·16	12·9
—first	19·59	20·79

SPROCKETS

Engine	23 teeth
Clutch	52 teeth
Gearbox	16 teeth
Rear wheel	52 teeth (early productions 49T)

CHAIN SIZES

Primary	Duplex ·375 in. × 70 links
Transmission	0·625 in. × 101 links (early models 99 links)

TRANSMISSION

FRAME AND FITTINGS

FRONT FORKS

Type	Coil-spring (hydraulically damped)
Springs—free length	10·75/10·875 in. (273·05/276·225 mm.
—spring rate	34 lb./in.
—number of coils	20½
—colour identification	Red/green

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

SWINGING ARM

Bush type	Bonded rubber
Bush diameter	1·250/1·253 in. (31·75/31·8262 mm.)
Housing diameter	1·247/1·248 in. (31·673/31·699 mm.)
Interference fit	·002/·006 in. (·0508/·1524 mm.)
Spindle diameter	·810/·811 in. (20·570/20·595 mm.)

FRONT FORK BUSHES

Outer diameter (top)	1·4750/1·4755 in. (37·465/37·477 mm.)
Outer diameter (bottom)	1·473/1·474 in. (37·414/37·439 mm.)
Inner diameter (top)	1·250/1·251 in. (31·750/31·755 mm.)
Inner diameter (bottom)	1·2485/1·2495 in. (31·711/31·737 mm.)
Working clearance (top)	·0005 in. (·0127 mm.)
Working clearance (bottom)	·002/·003 in. (·0508/·0762 mm.)
Length (top)	2·125 in. (53·975 mm.)
Length (bottom)	1·25 in. (31·75 mm.)
Shaft diameter	1·248/1·249 in. (31·699/31·7246 mm.)
Sliding tube bore diameter	1·475/1·477 in. (37·465/37·515 mm.)
Damper tube bush (outer diameter)	·6165/·6185 in. (15·6591/15·7099 mm.)
Damper tube bush (inner diameter)	·339/·340 in. (8·6106/8·636 mm.)
Damper tube bush (length)	·53125 in. (13·4937 mm.)

WHEELS, BRAKES AND TYRES

WHEELS

Rim size and type (front)	WM–18
Rim size and type (rear)	WM3–18
Spoke sizes:	
Front (long) 20	10 s.w.g. × 6 in. (3·251 × 152·4 mm.)
Front (medium) 10	10 s.w.g. × 5 7/32 in. (3·251 × 132·55 mm.)
Front (short) 10	10 s.w.g. × 5 3/16 in. (3·251 × 131·76 mm.)
Rear (long) 20	10 s.w.g. × 7·4375 in. (3.251 × 188.9125 mm.)
Rear (short) 20	10 s.w.g. × 7·375 in. (3·251 × 187·325 mm.)

WHEEL BEARINGS

Front (left and right-hand)	·875 × ·5625 in. single seal
Rear (left and right-hand)	·875 × 2 × ·5625 in. single seal
Rear brake drum	·875 × 2 × ·5625 in. double seal
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)	7 in. (177·8 mm.)
Front (width)	1·125 in. (28·575 mm.)
Rear (diameter)	7 in. (177·8 mm.)
Rear (width)	1·125 in. (28·575 mm.)
Lining thickness (front and rear)	·15625 in. (3·9687 mm.)
Lining area, sq./in. (sq., cm.)—front	14·6 (94·07)
—rear	15·48 (99·84)

TYRES

Size (front)	3·25 × 18 in. (82·55 × 457·2 mm.)
Size (rear)	4·00 × 18 in. (101·6 × 457·2 mm.)
Pressure (front)	16 p.s.i. (1·125 Kg./sq. cm.)
Pressure (rear)	16 p.s.i. (1·15 kg./sq. cm.)

12 VOLT ELECTRICAL EQUIPMENT

Battery	Lucas PUZ5A
Coil	Lucas MA.12
Contact breaker unit	Lucas 6CA
Generator	Lucas RM.19
Generator output	115 watt
Horn	Lucas 6H
Rectifier	Lucas 2DS.506
Zener Diode	Lucas ZD.715
Bulbs—headlamp (main)	50/40 watt
—headlamp (pilot)	6 watt
—main beam indicator	2 watt
—stop-tail lamp	6/21 watt

CAPACITIES

Fuel tank	3¼ galls/3·916 U.S. (14·774 litres)
Oil tank	4 pints/4·8 U.S. (2·273 litres)
Gearbox	0·5 pint/0·6 U.S. (·264 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	53 in. (134·62 cm.)
Overall length	83 in. (210·82 cm.)
Handlebar width	28 in. (71 cm.)
Seat height	32 in. (81·28 cm.)
Ground clearance	8½ in. (21·6 cm.)
Overall height	43¼ in. (109·8 cm.)

WEIGHTS

Machine unladen	320 lbs. (145 kg.)
Engine/gearbox unit (less carburetter)	85 lbs. (39 kg.)

TORQUE WRENCH SETTINGS (DRY)

Listed below are a number of nuts and bolts for which it has been found necessary to determine torque settings. It is most important that these settings are strictly adhered to. Over-tightening or non-uniform tightening of the cylinder head and barrel nuts for instance, can cause distortion, resulting in loss of compression, increased engine wear and poor fuel economy.

Application	Thread Dia. and Form	T.P.I.	Hex. A/F	Torque lb./ft. (kg./m.)
Carburetter flange nuts (SL)	0,3125 in. B.S.C.	26	0,525 in.	10 (1,383)
Clutch centre nut	0,50 in. B.S.C.	20	0,820 in.	60/65 (8,295/8,987)
Con. rod end cap nuts (SL) ...	0,3125 in. B.S.C.	26	0,525 in.	25/27 (3,456/3,733)
Crankshaft pinion nut... ...	0,625 in. B.S.F.	20	0,919 in.	35/40 (4,839/5,530)
Cylinder barrel nuts	0,375 in. U.N.F.	24	0,558 in.	26/28 (3,595/3,871)
Cylinder head stud nuts ...	0,3125 in. B.S.C.	26	0,525 in.	18/20 (2,489/2,765)
Fork leg cap nuts	1,0625 in. W.F.	20	1,300 in.	50/55 (6,913/7,604)
Fork leg pinch bolts	0,3125 in. B.S.C.	26	0,525 in.	18/20 (2,489/2,765)
Kickstart ratchet nut	0,50 in. B.S.C.	20	0,705 in.	50/55 /6,913/7,604)
Oil pump stud nuts (SL) ...	0,25 in. B.S.C.	26	0,440 in.	5/7 (,691/,968)
Rotor fixing nut	0,625 in. B.S.C.	20	1,010 in.	60 (8,295)
Valve cover nuts	0,3125 in. B.S.C.	26	0,525 in.	10 (1,383)
Valve cover nuts	0,25 in. B.S.C.	26	0,440 in.	5/7 (,691/,968)

Abbreviations:

A/F	Across Flats	T.P.I.	Threads Per Inch
B.S.C.	British Standard Cycle	U.N.F.	Unified Fine
B.S.F.	British Standard Fine	W.F.	Whitworth Form
SL	Self-locking		

TORQUE WRENCH EXTENSIONS

The torque figures listed above, indicate the load exerted at the end of a torque wrench. In some cases where space is restricted, the direct application of a torque wrench may be found impossible and a suitable extension or adaptor must be used.

Where using an extension however, the wrench dial reading must be altered according to the following formula, in order to achieve the recommended torque load.

$$\text{Wrench dial reading} = \frac{\text{Recommended torque load} \times \text{length of torque wrench (in.)}}{\text{Length of torque wrench (in.)} + \text{length of extension (in.)}}$$

(For example): To obtain a torque load of 30 lb./ft. when using a two foot long wrench with a six inch extension, the dial reading would be calculated in the following manner:—

$$\text{Wrench dial reading} = \frac{30 \times 24}{24 + 6}$$

$$\text{therefore} = 24 \text{ lb./ft.}$$

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 kilos

One Kilo—·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)	HEX. 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)	HEX. 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 40	20 T.P.I. series			Major	Effective	Minor
1/8			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 max.	Nut min.	Bolt max.	Bolt min.	HEX. Flats	HEX. Corners	Nut thickness
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	28·25	15	18·83	20	14·12	25	11·30	30	9·42	35	8·07	40	7·06	50	5·65	60	4·71	70	4·04
10½	26·90	15½	18·22	20½	13·78	25½	11·08	30½	9·26	35½	7·96	41	6·89	51	5·54	61	4·63	71	3·98
11	25·68	16	17·66	21	13·45	26	10·87	31	9·11	36	7·85	42	6·73	52	5·43	62	4·55	72	3·92
11½	24·56	16½	17·12	21½	13·14	26½	10·66	31½	8·97	36½	7·74	43	6·57	53	5·33	63	4·48	73	3·87
12	23·54	17	16·61	22	12·84	27	10·46	32	8·83	37	7·63	44	6·42	54	5·23	64	4·41	74	3·82
12½	22·60	17½	16.14	22½	12·55	27½	10·27	32½	8.69	37½	7·53	45	6·28	55	5·13	65	4·35	75	3·77
13	21·73	18	15·69	23	12·28	28	10·09	33	8·56	38	7·43	46	6·14	56	5·04	66	4·28	76	3·72
13½	20·92	18½	15·27	23½	12·02	28½	9·91	33½	8·43	38½	7·34	47	6·01	57	4·96	67	4·22	77	3·67
14	20·18	19	14·87	24	11·77	29	9·74	34	8·31	39	7·24	48	5·89	58	4·87	68	4·16	78	3·62
14½	19·48	19½	14·49	24½	11·53	29½	9·58	34½	8·19	39½	7·15	49	5·77	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
+	·142	·710	1·279	1·846	2·415	2·983	3·552	4·120	4·688
+	·284	·852	1·420	1·989	2·557	3·125	3·125	4·6F4	4·830
+	·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

SECTION A

LUBRICATION SYSTEM

INDEX

SECTION A1

ROUTINE LUBRICATION

Ref. No.		*Ref. No.*	
	Weekly	11	Oil front brake cam spindle
2	Check oil level in tank	5	Grease rear brake cam spindle
12	Grease brake pedal pivot	1	Lubricate rear chain
4	Oil exposed cables and control rod joints		**Every 5,000 Miles (8,000 Km.)**
	Every 500 Miles (800 Km.)	6	Grease speedometer drive cable
10	Check oil level in primary chaincase	3	Lubricate contact breaker cam
	Every 2,000 Miles (3,200 Km.)	3	Lubricate auto-advance mechanism
2	Drain and refill the oil tank	9	Drain and refill gearbox
9	Check oil level in gearbox	10	Drain and refill primary chaincase
2	Clean the oil filters		**Every 10,000 Miles (16,000 Km.)**
—	Examine pump ball valve	13	Drain and refill front forks
—	Grease centre stand	—	Grease wheel bearings
—	Lubricate prop stand (oil)	—	Grease steering head bearings

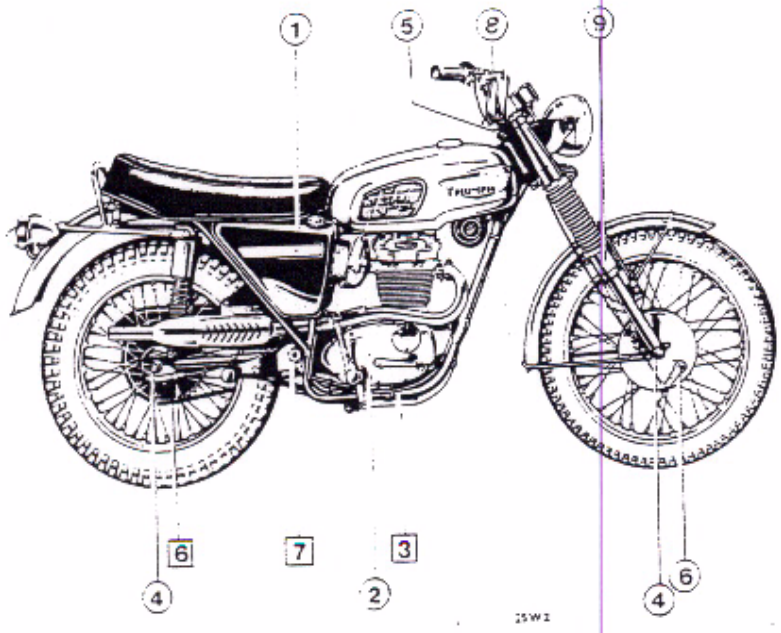

Fig. A1. KEY LUBRICATION POINTS

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

SECTION A2

RECOMMENDED LUBRICANTS

UNITED KINGDOM AND OVERSEAS

ENGINE OILS			GEARBOX OILS		OIL Front Forks and Primary Chain	GREASE
Brand	Summer	Winter	Summer	Winter		
MOBILOIL	BB	A	Mobilube GX.90	Mobilube GX.80	Arctic	Mobilgrease MP
SHELL ...	X100–40	X100–30	Spirax 90.EP	Spirax 80.EP	X100–20W	Retinax A
CASTROL	XL	XL	Hypoy 90.EP	Hypoy 80.EP	Castrolite	Castrolease LM
ESSO ...	Esso Motor Oil 40/50	Esso Motor Oil 20W/30	Gear Oil EP.90	Gear Oil EP.80	Esso Motor Oil 20/30W	Esso Multipurpose Grease H
B.P. ...	S.A.E. 40	S.A.E. 30	B.P. Gear Oil 90.EP	B.P. Gear Oil 80.EP	S.A.E. 20W	Energrease L2
REGENT ...	Havoline S.A.E. 40	Havoline S.A.E. 30	Multigrade Lubricant 90.EP	Multigrade Lubricant 80.EP	Havoline S.A.E. 20W	Marfak Multipurpose 2

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

NOTE. During factory testing the engine is run on a mineral-base oil and a similar type of oil **must** be used thereafter. If it is desired to change to a vegetable-base oil, the engine lubricating system must be thoroughly cleansed of the previous lubricant. If the two types of oil are mixed, an emulsion will be formed which may damage the engine. A vegetable-base oil **must not** be used in the primary chaincase, because of the possible harmful effects on the electrical equipment.

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 tank 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 tank 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.

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 tank at a greater rate than that of the feed side. This ensures that the sump never floods; hence the term "dry sump".

The oil return pipe is tapped at the crankcase union

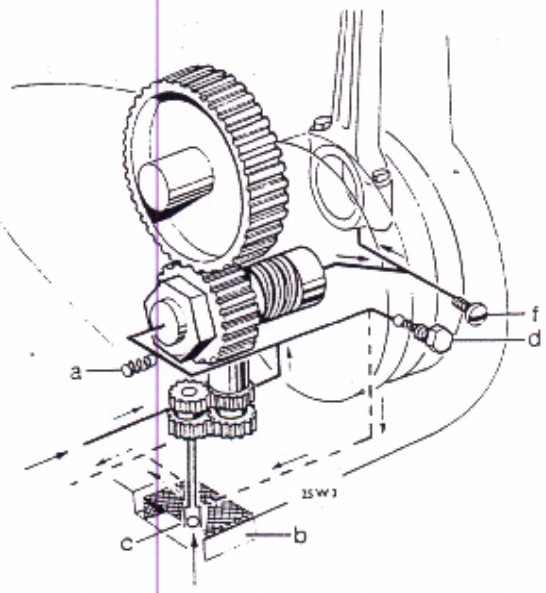

Fig. A2. Engine lubrication system showing ball valves

to provide a supply of oil at low pressure to the valve rocker gear. The TR25W has only one oil pipe union at the rocker box.

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. The right side panel which is secured by three screws must be removed for oil changing.

The oil tank filter is screwed into the lower right-hand corner of the tank (see Fig. A3). Obtain a suitable container with a piece of cardboard to use as a chute, unscrew the filter (which has a normal right-hand thread) and allow the oil to drain. Wash the filter thoroughly in petrol and allow to dry.

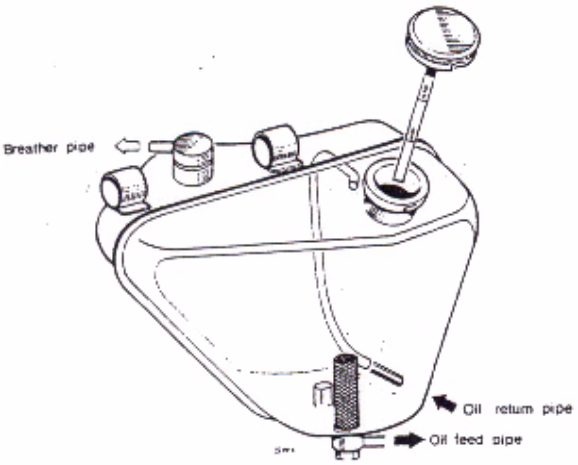

Fig. A3. Oil tank and filter

Lean the machine towards the right-hand side to drain off any remaining oil in the tank.

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. Also disconnect the supply and scavenge pipes at the crankcase union (one nut).

Allow the oil to drain, wash the filter thoroughly in petrol, and clean off the old jointing material from the filter and crankcase. If there is any sign of damage to the old gasket, replace it on reassembly.

When refilling the oil tank, do not exceed the recommended level marked on the filler cap dipstick, as the air space above the oil is essential for correct breathing. If the space is reduced, oil is liable to be blown out of the breather tube.

To ensure an accurate oil level, the machine must be supported vertically, **not** on the prop stand.

After starting the engine, there will be some delay before the oil is seen issuing from the return pipe. This is because initially, the crankcase sump is clear of oil.

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, pull the ball up off its seating and allow it to drop of its own weight. If the ball will not drop it indicates a build-up of sludge which can usually be cleared by immersing the pipe in petrol for a short period.

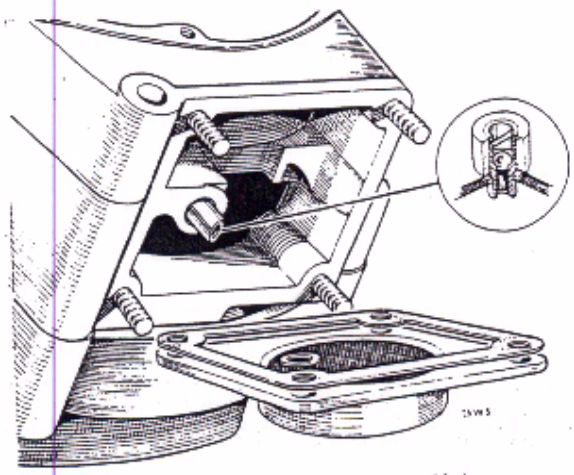

Fig. A4. Scavenge Non-return Valve

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 tank. This is the valve in the inner timing cover described in Section A10.

SECTION A7

CRANKCASE OIL PIPE UNION

The oil pipe union is secured to the crankcase with one nut. If the small rubber sealing rings in the oil pipe union are damaged, they must be replaced.

Note: The oil pipes are correctly fitted when crossed over, i.e., the outer pipe from the tank is attached to the inner connection on the crankcase.

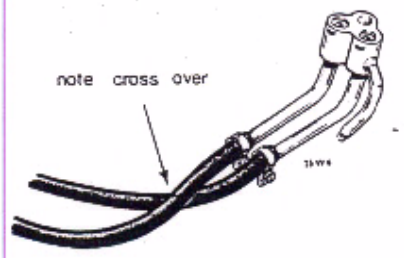

Fig. A5. Crankcase oil pipe union

SECTION A8

OIL PRESSURE RELEASE VALVE

A constant oil pressure is maintained by the release valve situated on the front right-hand side of the crankcase (see Fig. A6).

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

The valve is pre-set at the works and there is no point in altering the setting. However, after prolonged use, the spring does tend to weaken and corrode and must then be replaced. If there is corrosion it is wise to replace the ball also, after first cleaning the valve body.

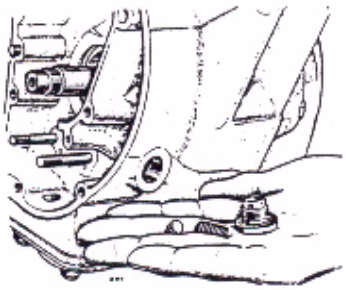

Fig. A6. Pressure release valve

To remove the valve, simply unscrew the large hexagon plug. Ensure that the fibre washer is fit for further use.

SECTION A9

LOW OIL PRESSURE

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

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

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

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

(4) Oil pipes incorrectly connected, when the pump would be inducing air through the return pipe.

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. A7). 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.

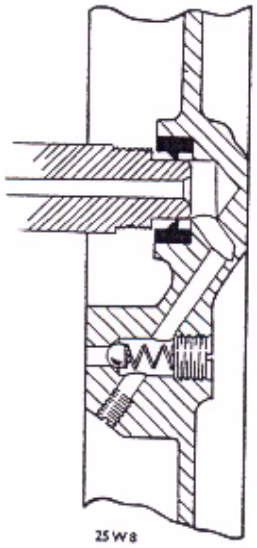

Fig. A7. Non-return valve

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.

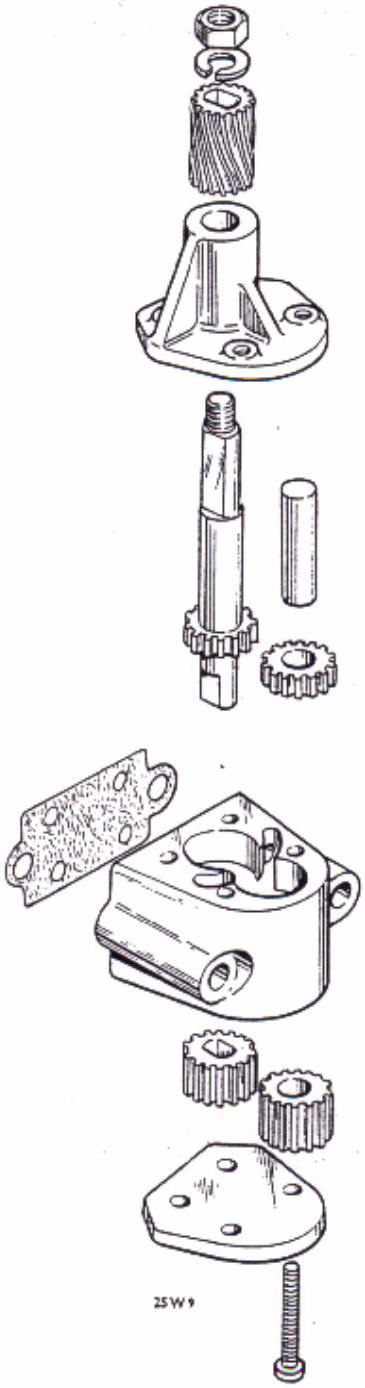

Fig. A8. Oil pump exploded

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.

CRANKCASE BREATHER

The short crankcase breather pipe emerges from the timing case near to the clutch cable abutment.

It is most important that this pipe is unobstructed and a regular examination should be made to ensure this.

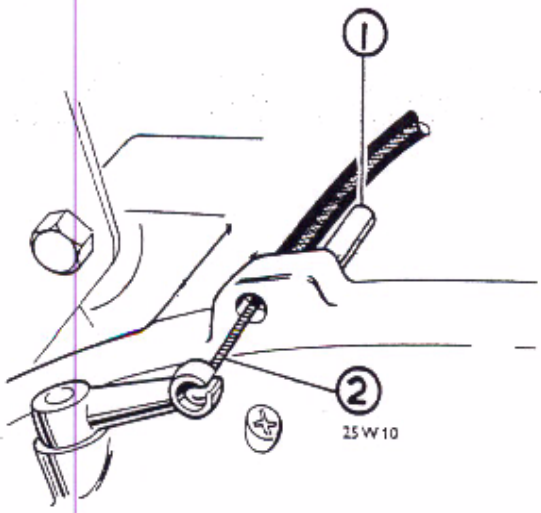

Fig. A9. Crankcase breather

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 at 6,000 mile intervals. This is done by adding a mere dab of grease to the breaker cam only.

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.

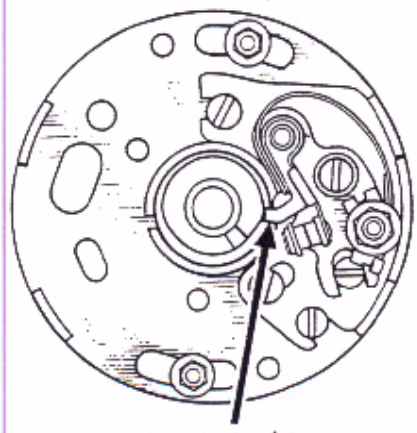

Fig. A10. Contact breaker

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

After lubricating, replace the plate to the marks, but if the timing has been upset, follow the instructions in Section B28.

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 cum 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 in 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.

The oil in the primary chaincase does not lubricate the chain only, the clutch being contained in the same case is dependent on this oil supply also.

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

There are two of the chaincase cover screws which have their heads painted red; they are situated midway along the lower rim of the case, the rear one being the oil level screw (C) and the front is the drain screw (D)—see Fig. A10. Note that these screws are fitted with aluminium washers to ensure oil-tightness.

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

Cap (*B*) 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.

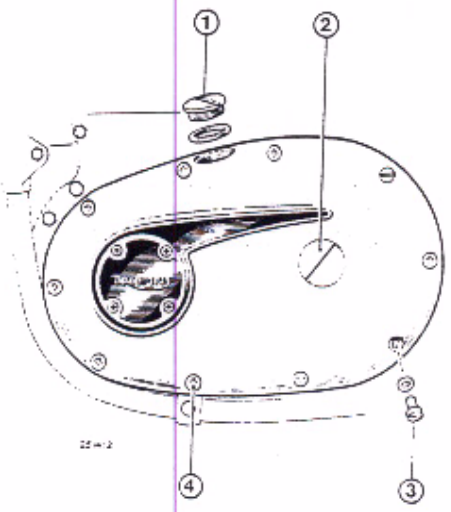

Fig. A10. Primary chaincase drain, level

SECTION A15

REAR CHAIN

Oil thrown off the primary chain is collected in a small well at the back of the primary case from which a drip feed is supplied to the rear chain.

This supply is dependent on the maintenance of the correct oil level in the primary chaincase.

This may not, however, be adequate in some circumstances and it is advisable to supplement the drip feed by occasionally applying oil to the chain links with an oil can.

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).

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 out all the old grease from the bearing cups and clean the ball bearings, by rolling them in a clean rag.

After cleaning, carefully examine the bearings, cups and cones for pitting, corrosion or cracks, and renew if necessary.

The fresh grease will hold the ball bearings in position during reassembly. Check that the grease is as quoted in Section A2. There are twenty ball bearings for each cup.

SECTION A17

TELESCOPIC FORK

The oil contained in the fork legs not only lubricates the bearing bushes, 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 E4.

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, raise the cap nuts a few inches and pour ½ pint of oil into each fork leg (see Section A2 for recommended grades of oil).

Ensure that the rubber sealing washer and special retainer are correctly fitted below the damper rod locknut before replacing the cap nuts.

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

pack with correct grade of grease as quoted in Section A2 after assembling the first bearing.

The rear brake drum bearing, having a double oil seal, does not require lubrication.

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 A2).

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.

SECTION A20

SPEEDOMETER CABLE

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

SECTION B

ENGINE

INDEX

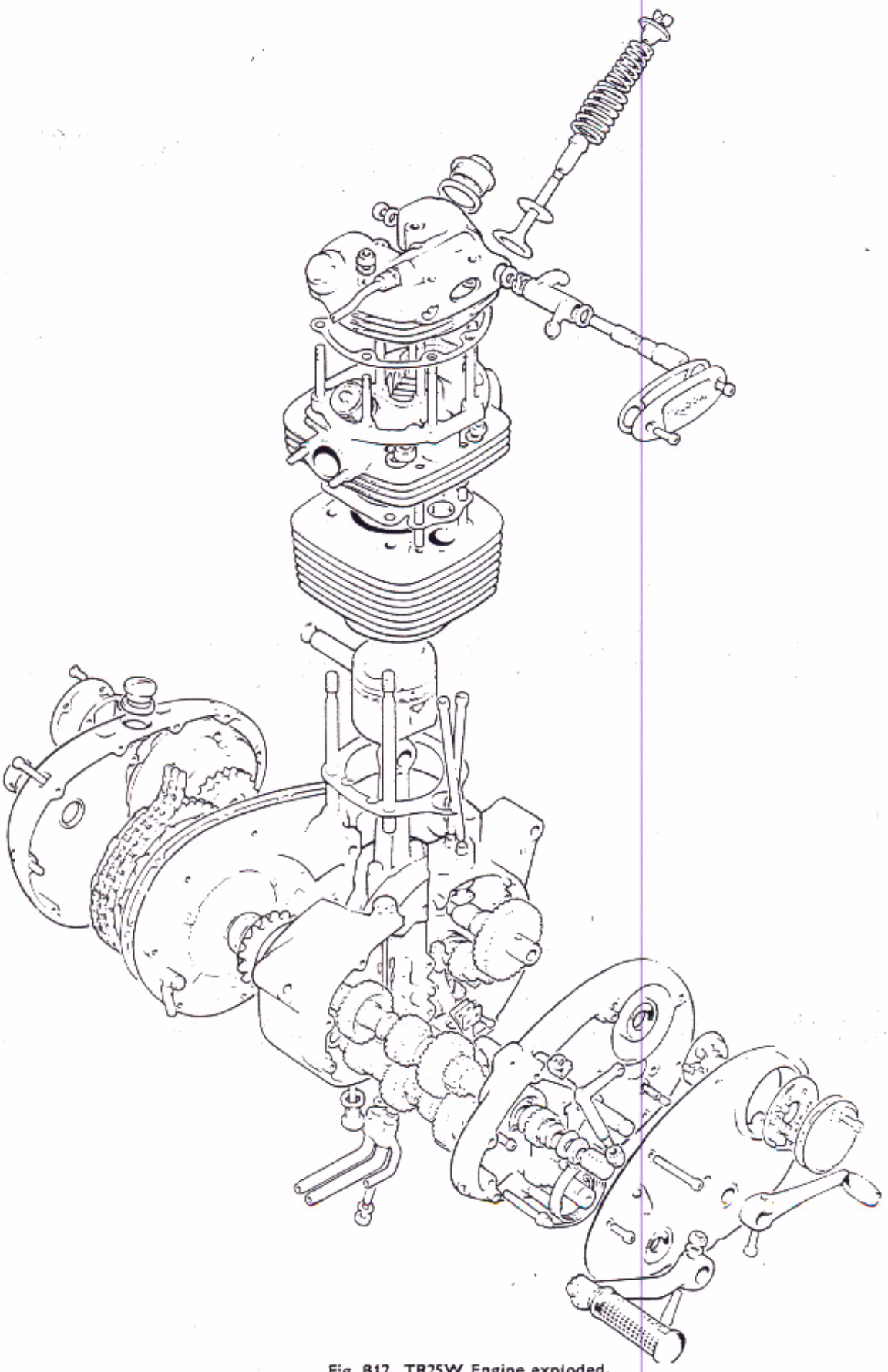

Fig. B12. TR25W Engine exploded.

DESCRIPTION

The TR25W 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 one-piece, 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

Before commencing with the work, it is advisable to have the following equipment available:—

Spanners for $\frac{5}{16}$ in. W., $\frac{1}{4}$ in. B.S.F. to $\frac{5}{16}$ in. W., $\frac{3}{8}$ in. B.S.F.
Set of scrapers.
Set of feeler gauges.

Supply of fine grade emery cloth.

Jointing compound or cement.

Valve grinding tool and coarse/fine grade grinding paste.

Valve spring compressor.

Clean engine oil.

Pieces of hard wood to support piston.

Top overhaul gasket set

Gudgeon pin circlips (2)

Valve springs (set)

Paraffin and clean rag for cleaning.

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 exhaust pipe is a push-fit into the cylinder head and can be withdrawn after loosening the finned collar. The silencer clip, of course, must be slackened off but it will not be necessary to detach the silencer.

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

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

Because the clearance between the cylinder head and the frame top tube is very limited, it will also be necessary to take off the horn and the coil to provide greater access. Note carfully, the terminal location of each cable.

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 in 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.

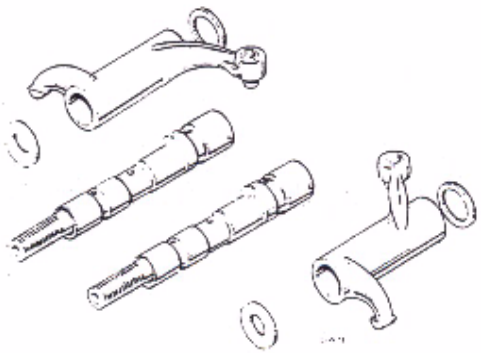

Fig. B2. Valve rocker assembly

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, swilled in paraffin, 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.

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 driven out with service tool No. 61-3382 but, the aluminium cylinder head should first be heated. The new guide can be driven in with the same punch 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.

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 with valve seat cutter tool No. 61-3300 used with pilot No. 61-3293 and holder No. 61-3290. The seat angle is 45 degrees.

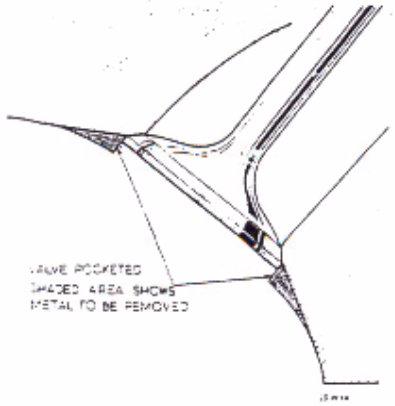

Fig. B3. Pocketed valve

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 30° angle cutter before re-cutting the seat or grinding-in the 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.

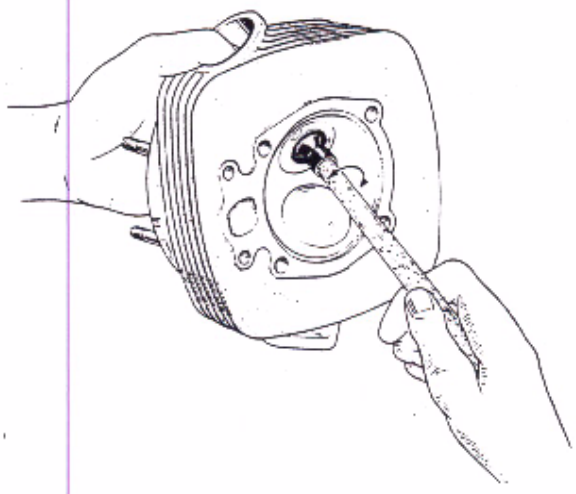

Fig. B4. Grinding-in valve

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.

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.

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.

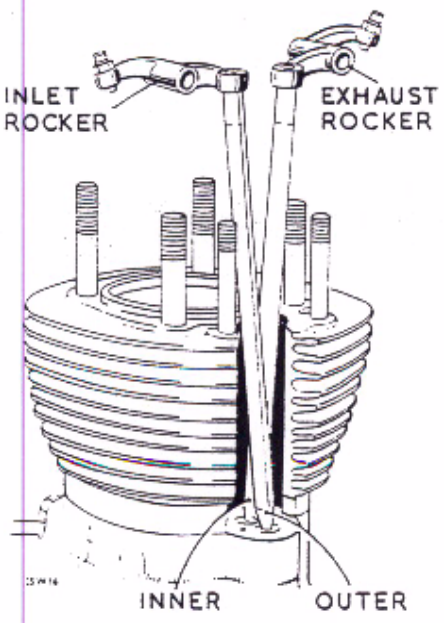

Fig. B5. Fitting the pushrods

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 GD6. Check that the push rods are correctly located in their proper positions and tighten the rocker box fixing nuts.

Check the valve clearances as described opposite 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(s) using new copper sealing washers where necessary.

Replace the exhaust pipe and secure in position with the front engine mounting bolt. Do not omit to tighten the silencer clip and the finned collar. Refit the engine stay bracket and reconnect the exhaust valve lifter assembly. Replace the horn and ignition coil, before finally fitting the petrol tank as described in Section D.

If the engine was removed for decarbonising, see Section B8 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.

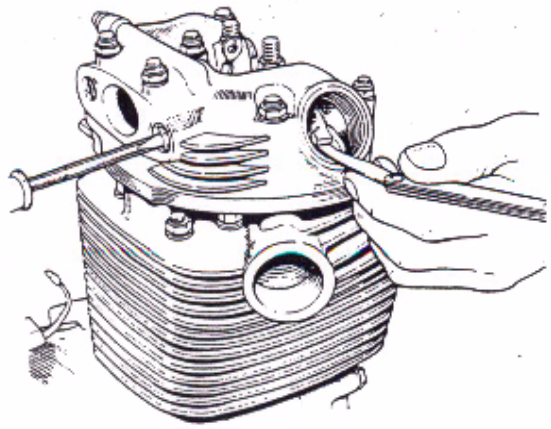

Fig. B6. Checking valve clearances

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

These motors have an eccentric cam on each rocker 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 (see Fig. 3). 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*.

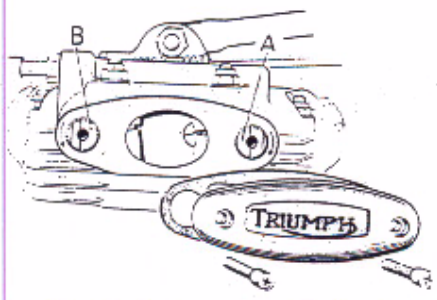

Fig. B7. Valve rocker adjustment

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 ½ 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 service tool Z72.

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.

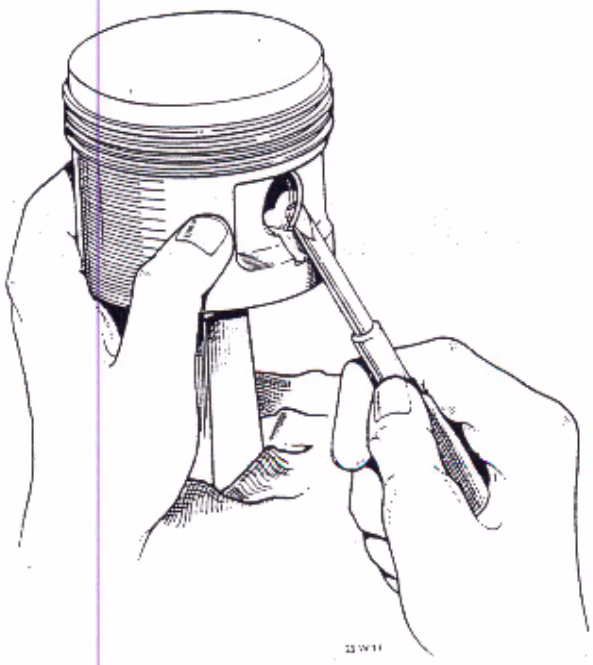

Fig. B8. Removing circlip

If the gudgeon pin comes out easily before the piston is warm then the pin or bush 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.

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 then 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/.014 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 .007 in. the ends of the ring must be carefully filed to the correct limit.

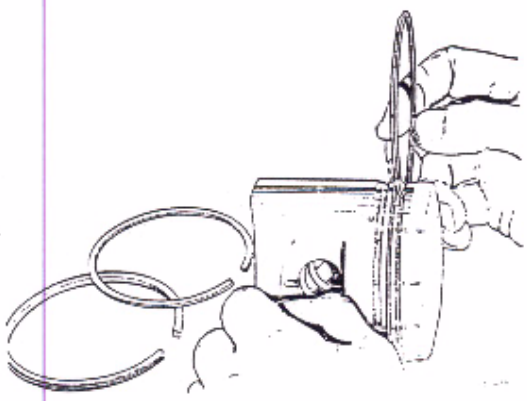

Fig. B9. Checking ring grooves

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.

SECTION B6

SMALL-END BUSH

The small end bush wear, which normally is very slight, can be estimated when sliding the gudgeon pin through the bush. If it is in good condition the pin will be a sliding fit in the bush, with no play being in evidence. Renewal of the small end bush can be easily achieved by using the new bush "C" to press out the old one. For this purpose a threaded bolt about 4 in long "A" and a $1\frac{1}{4}$ in. long piece of tube with an inside diameter of $\frac{7}{8}$ in. "B" will be required.

Place a suitable washer and the new bush onto the bolt, then offer it into the old bush. Place the piece of tube and a suitable washer over the bolt and screw the nut on finger tight. Centralise the bush and tube and align the oil way in the new bush with that in the connecting rod. When the nut is tightened the new bush will extract the old one.

Finally, ream the bore of the bush to .6890/.6894 in. taking care not to allow any metallic particles to enter the crankcase. When reaming the bush, ensure that its bore is parallel with the big end bore.

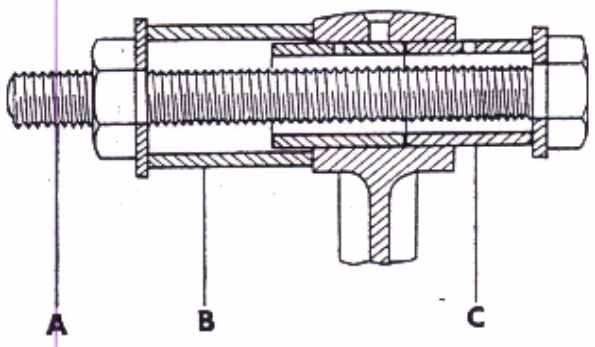

Fig. B10. Extracting a small end bush

SECTION B7

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.

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. 61–3682 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.

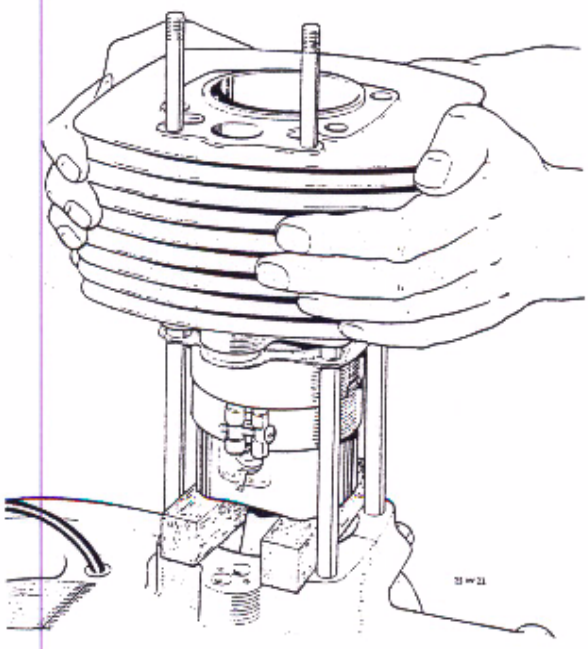

Fig. B11. Replacing cylinder barrel

SECTION B8

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. It will not be necessary to drain this, but only to turn off the taps and disconnect the pipes. The tank is mounted on rubber pads and is secured by a nut on a single bolt, which passes through a rubber sleeve in the centre of the tank to its anchorage on the frame top tube.

(b) Release the exhaust pipe from the front engine mounting, loosen the silencer clip and slacken the bolt in the finned collar. The exhaust pipe is a push-fit into the cylinder head port and can now be withdrawn from the front.

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

(d) Disconnect the generator and the contact breaker leads from their snap connectors behind the engine. Also disconnect the high-tension lead and take out the sparking plug.

(e) 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 stay bracket complete with the exhaust valve lifter assembly, and to gain more access, take off the horn and ignition coil.

(g) Remove the chainguard (see page 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.

The engine/gearbox unit is mounted in the frame at three points. At the rear the attachment is by two triangular plates welded to the frame tube, the engine being held by one stud with two 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. To enable the rear fixing stud to be released from the frame brackets, it will be necessary to raise the engine slightly. Take care when withdrawing the stud as the engine may shift its position suddenly.

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

Replacement of the engine unit is a reversal of the above procedure for removal but, to save a great deal of time and effort, the rear fixing stud should be replaced first. Note that a spacer is fitted on the right-hand side of the front fixing bolt. 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 B9

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 B10

REMOVING PRIMARY CHAINCASE COVER

The primary chaincase cover is held in place by ten Phillips-head screws, two of which are the oil level and drain screws, fitted with aluminium washers.

Note that the rear chain oiler is held to the back of the primary drive case by a single bolt with fibre washer.

Drain the oil as described in Section A4 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 B11

CLUTCH DISMANTLING

Remove the locking wires and 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, and to insert a bar through the connecting rod small-end bush. 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 B12 before the chainwheel is disturbed.

SECTION B12

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 the electrical section.

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 B13

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. (4242 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 slots for wear; if they 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.

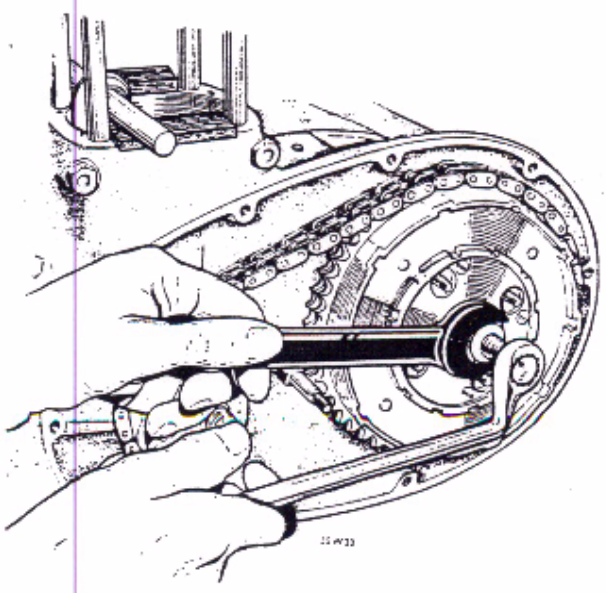

Fig. B12. Removing clutch

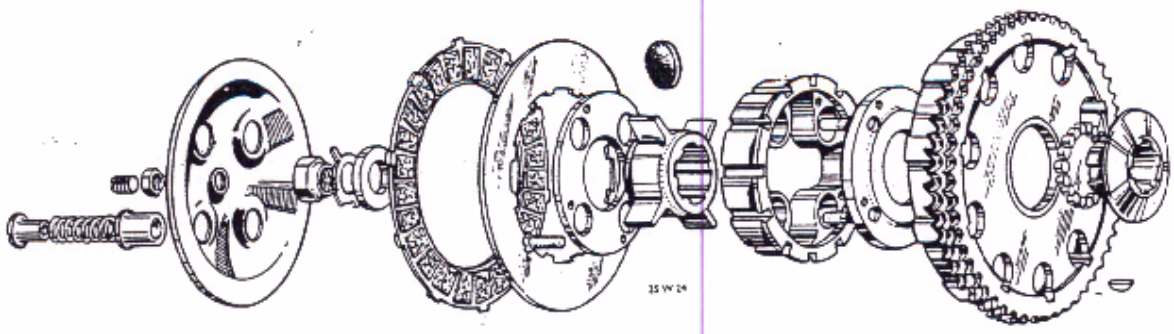

Fig. B13. Clutch exploded

SECTION B14

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 B15

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.

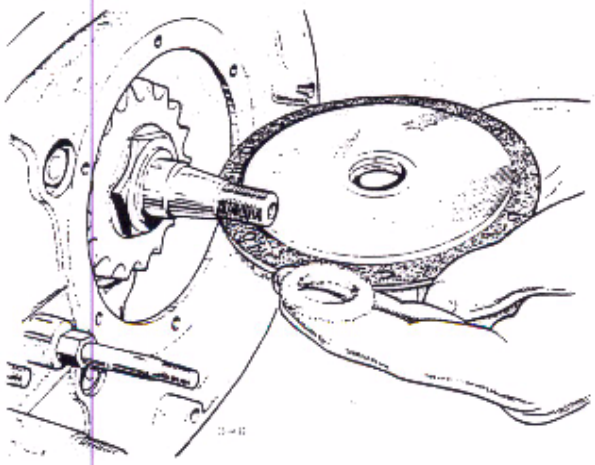

Fig. B14. Gearbox sprocket cover

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 B16

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 principal, 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 B17 for details of clutch adjustments.

SECTION B17

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 sleeve 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.

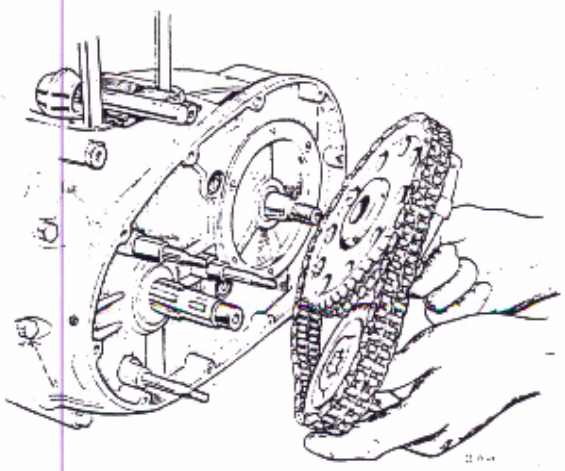

Fig. B15. Fitting primary drive

See that the Woodruff keys are fitted to both mainshafts and that they are a good fit in the keyways.

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 sleeve, then the tab washer and fixing nut. After tightening the nut, 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 then since they are quite inexpensive.

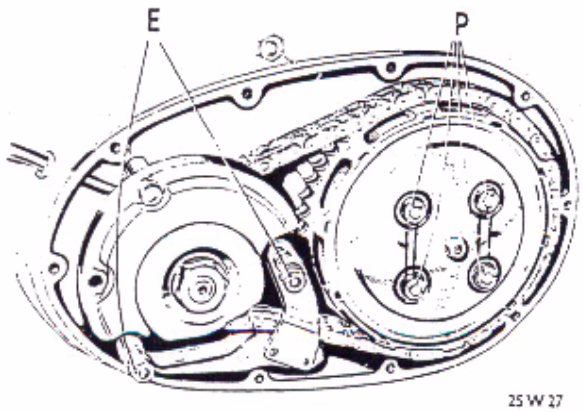

Fig. B16. Chain and pressure plate adjustment

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".

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.

Replace the rotor on to the keyed engine shaft with its "Lucas" marked face outwards and fit the tab washer and nut.

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. Some earlier engines were fitted with plain stator studs, the top one having one long spacer and the rear one, two small spacers.

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 and that the rear chain oiler is replaced.

See that the oil level and drain screws are correctly located in the lower edge of the case and are fitted with aluminium washers.

SECTION B18

REMOVING AND REPLACING THE CONTACT BREAKER

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.

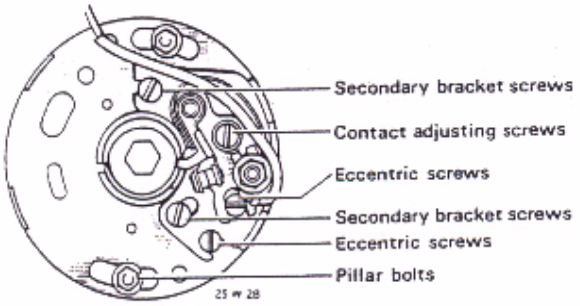

Fig. B17. Contact breaker unit

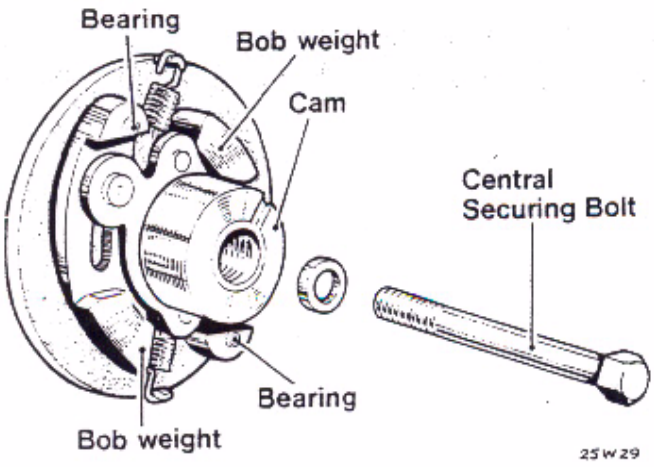

Fig. B18. Automatic advance unit

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

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 CONTACT BREAKER

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 61-3761.

Avoid removing the auto-advance unit unnecessarily as the timing will have to be reset. During reassembly refit loosely and retime the ignition as detailed in Section B28.

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. Turn the engine until the nylon heel is on the cam at the scribe marking, slacken the contact screw and turn the eccentric screw until, checking with a feeler gauge at 0.015 in. (0.381 mm.), the gap is correct. Retighten the contact 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 B28 for full details of ignition timing.

SECTION B19

TIMING COVERS

To obtain access to the timing gears or the gearbox components it will be necessary to remove the covers on the timing 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. The cover, complete with contact braker 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.

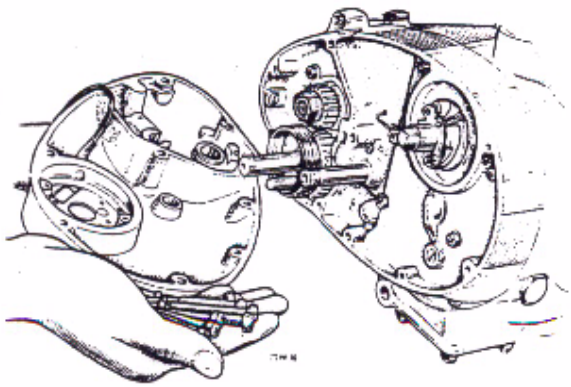

Fig. B19. Removing outer timing cover

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

Cut if needed, 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 B18.

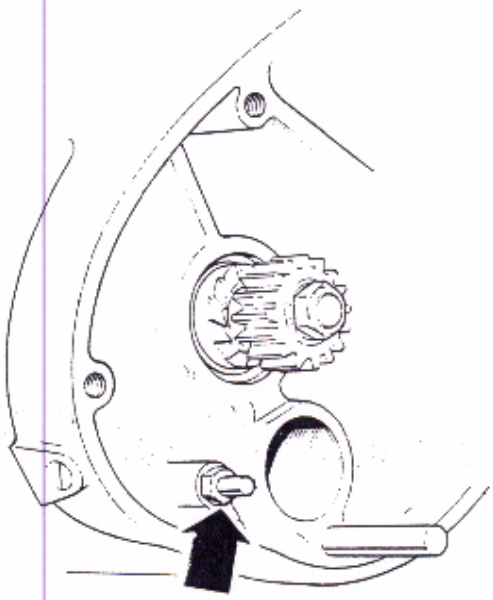

Fig. B20. Kickstart anchor bolt

Take out the seven fixing screws and note that the breaker cable clip fits under the uppermost central fixing screw. Also unscrew the kickstart spring anchor bolt (see Fig. B20). 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.

Take care not to 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.

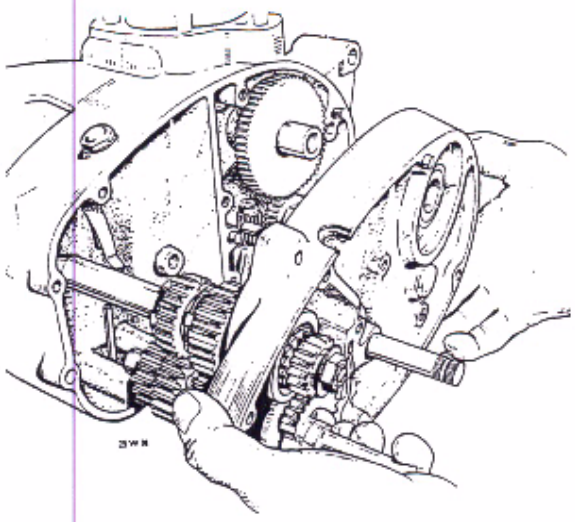

Fig. B21. Removing inner timing cover

SECTION B20

REMOVING AND REPLACING OIL PUMP

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

Use a suitable bar through the connecting rod 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. 60–3773 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 two 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 periodical 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. Locate the pump over the studs, replace the fixing nuts and tighten evenly to a torque wrench setting of 7 lb./ft.

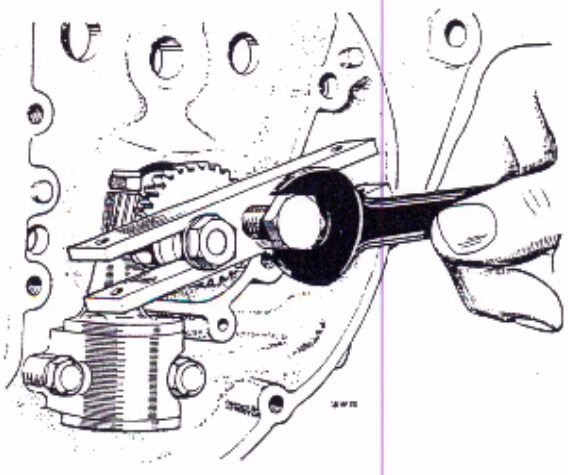

Fig. B22. Removing the timing pinion

SECTION B21

TIMING GEARS AND TAPPETS

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

These marks are to assist in correct reassembly, so ensuring precise valve timing. It is good practice to familiarise oneself with them before removing the gears (see Fig. B23).

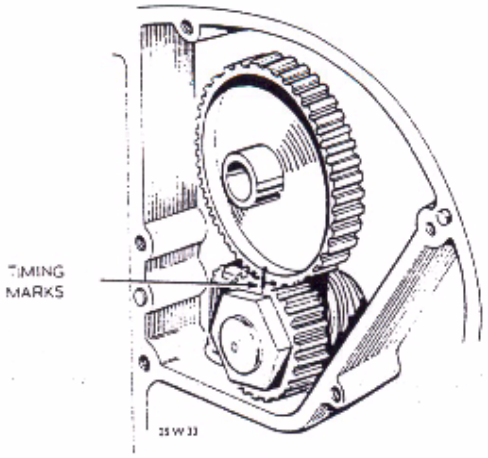

Fig. B23. Timing marks

The removal of the crankshaft pinion and oil pump wormdrive is described in the section dealing with oil pump removal.

Pull the camshaft, with pinion, from its location in the crankcase and allow the tappets to fall clear. The pinion is a push-fit on to the keyed end of the camshaft.

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

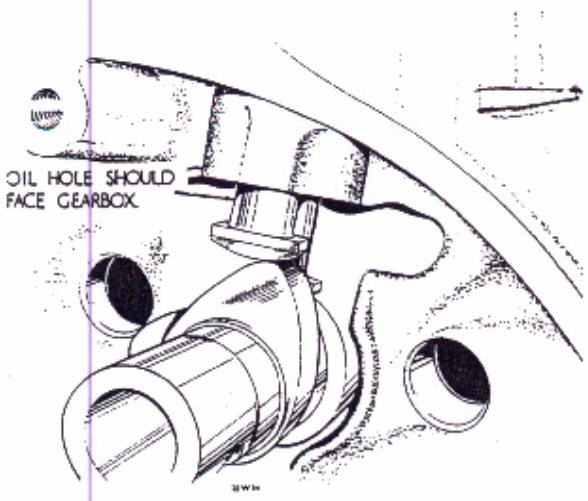

Fig. B24. Correct fitting of tappets

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.

Reassembly of the timing gear is the reversal of the above procedure for dismantling, but care must be taken to match the timing marks on the pinions.

SECTION B22

DISMANTLING THE GEARBOX

GEARCHANGE MECHANISM

First remove the timing covers, as detailed in Section B19.

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.

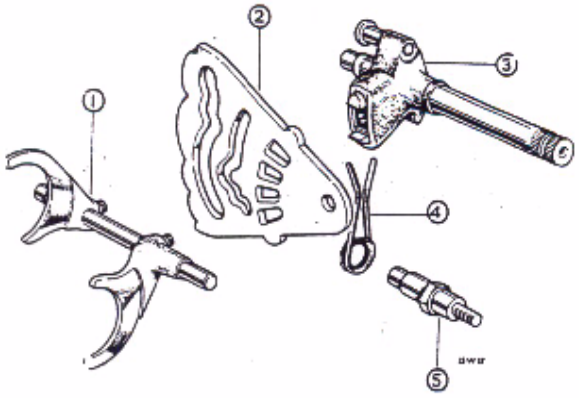

Fig. B25. Gearchange mechanism

Take out the large split pin from the outside of the cover and withdraw the cam plate 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. B26).

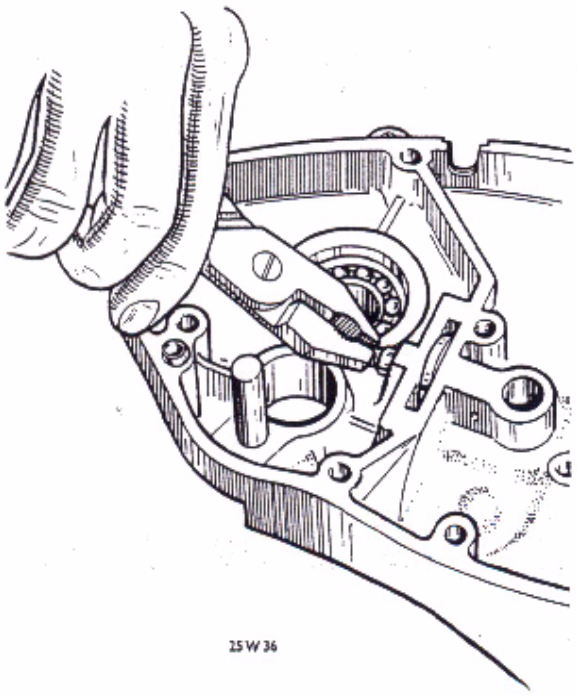

Fig. B26. Removing the cam plate pivot pin

The cam plate 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 a letter "T" (see Fig. B28) 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.

GEAR CLUSTER

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

To remove first grip the shaft 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.

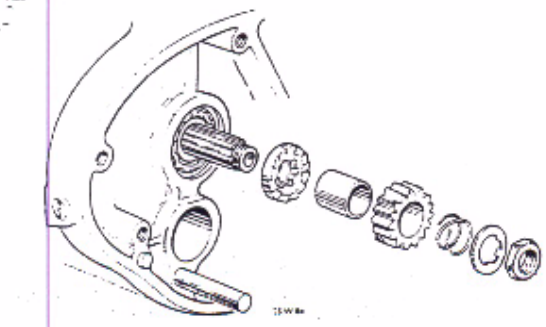

Fig. B27. Kickstart ratchet

The smaller gear is a press-fit on to the shaft, so retaining the larger gear which has a spacer between it 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 one 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 B15), 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

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. B28 for guidance), insert the pivot pin and secure with the slit 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.

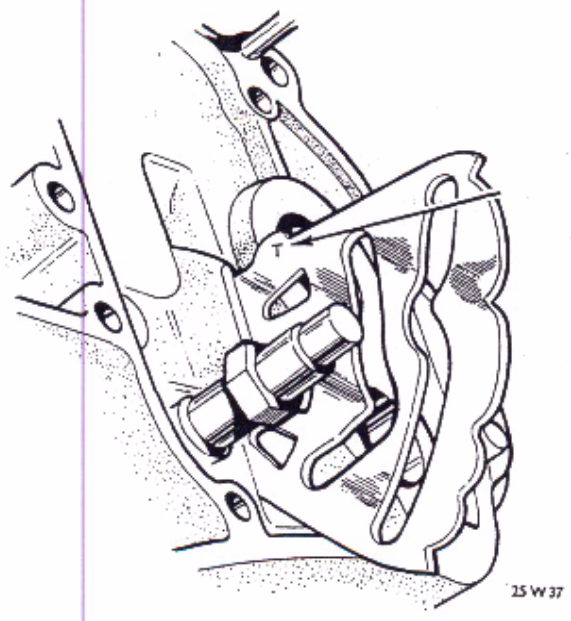

Fig. B28. Showing camplate marking

Holding the cover face down, place the layshaft low gear with its shim (C) Fig. B29, 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 (see page B23). 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.

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 is pressed home.

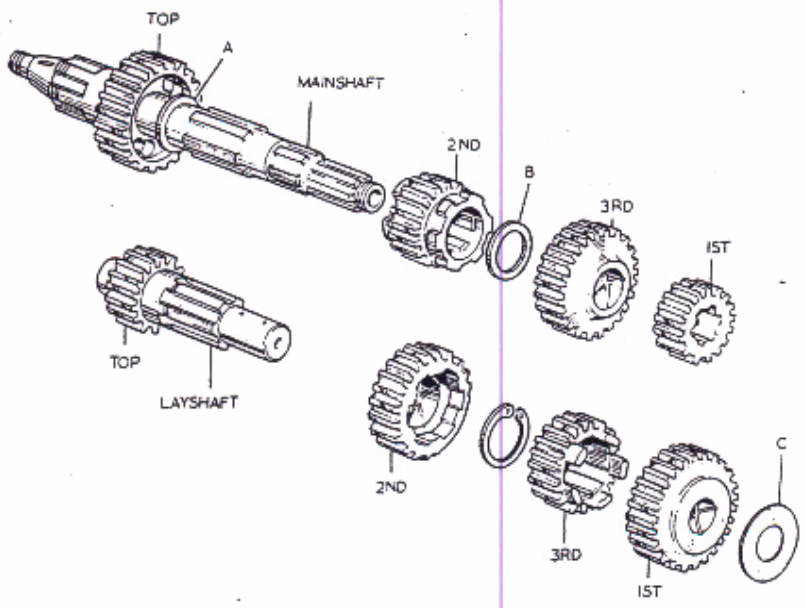

Fig. B29. Gear cluster exploded

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. B29 for position of each spacer, the thicknesses and part numbers of which are as follows:—

A. .093/.094 in. (40–3020);
.098/.099 in. (40–3126);
.103/.104 in. (40–3127).

B. .070/.071 in. (40–3119);
.075/.076 in. (40–3019);
.080/.081 in. (40–3120).

C. Standard shim (40–3258).

D. .078/.080 in. (41–3072);
.083/.085 in. (41–3074).

Before proceeding with engine assembly, check the gear selection for correct operation.

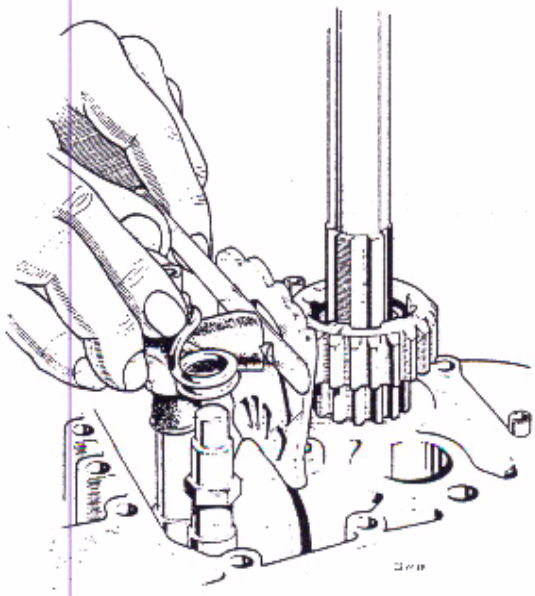

Fig. B30. Fitting the gearchange quadrant

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 reomove 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.

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, and break the crankcase joint by tapping gently with a hide-mallet.

Do not attempt to prise the crankcase halves apart by using a tool between the joint as this will only damage the joint faces. The best method to use is to tap the gear-side shaft with a hide-mallet, so enabling the drive-side half of the case to be drawn away complete with flywheel assembly. The flywheel assembly can now be carefully tapped out of the drive-side case. Take care not to lose the gear-side shaft spacing shim.

Do not omit to replace the oil seal for the drive-side bearing.

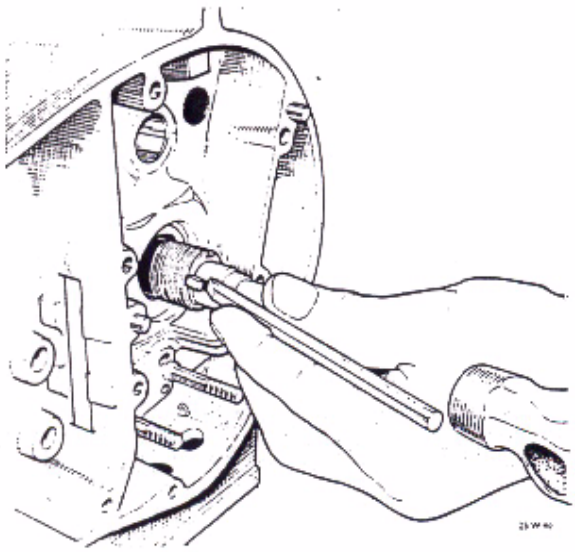

Fig. B31. Removing a Woodruff key

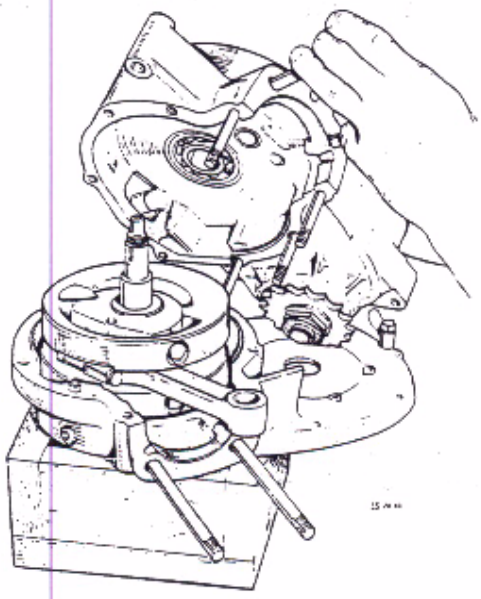

Fig. B32. Splitting the crankcase

SECTION B24

CRANKSHAFT AND BIG-END

Removal of the connecting rod from the crankshaft is quite straightforward but, to assist in correct re-assembly, it is recommended that the rod and its cap are marked. Using a suitable tube spanner, unscrew the cap retaining nuts 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 below.

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.

To facilitate re-grinding of the crankshaft, the flywheels must first be detached. 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. When refitting, apply a small amount of Triumph "Loctite" to the threads of the bolts. It is most important that the radii at the inner faces of the journal remain at .070/.080 in.

On completion of regrinding, the appropriate undersize must be clearly marked on the outer face of each crankshaft web.

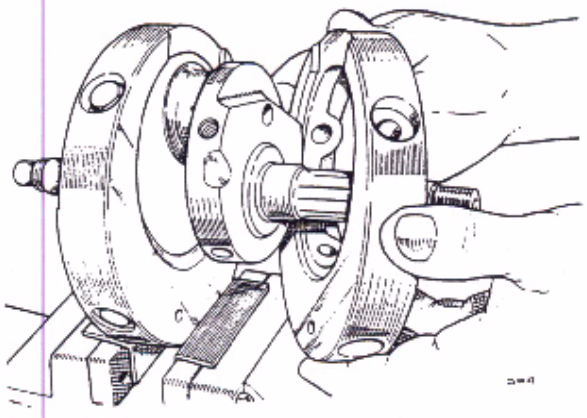

Fig. B33. Removing a flywheel

	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 a new or reground crankshaft or flywheels have been fitted, 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. The equipment required is a drilling machine with depth stop and knife-edges. The rollers must be set perfectly horizontal. To ensure accurate balancing, a weight equivalent to 58% of the reciprocating weight (part No. 61–3809) 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.

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.

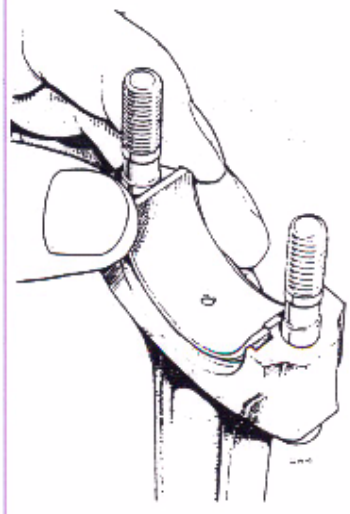

Fig. B34. Fitting a bearing shell

SECTION B27

REASSEMBLING THE CRANKCASE

Assuming that the bearings, bushes and oil seals have been checked and, where necessary, replaced, the crankcase can now be reassembled.

The crankshaft endfloat should be between .002 in. and .005 in. This is controlled by shims fitted between the crank web and the inner face of the right-hand bearing. The shims are available in thicknesses of .010 in. (40/66) and .015 in. (40/69). If, however, the original crankshaft is being refitted, it will only be necessary to see that the shims are replaced.

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.

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 engine shaft 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, but do not omit to replace the keys in the ends of the shafts before fitting the pinions or sprockets.

SECTION B28

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 B18.

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 obtained, so that the engine may be turned either backwards or forwards by rotation of 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).

Remove the small inspection cover at the forward end of the primary drive case to expose the generator

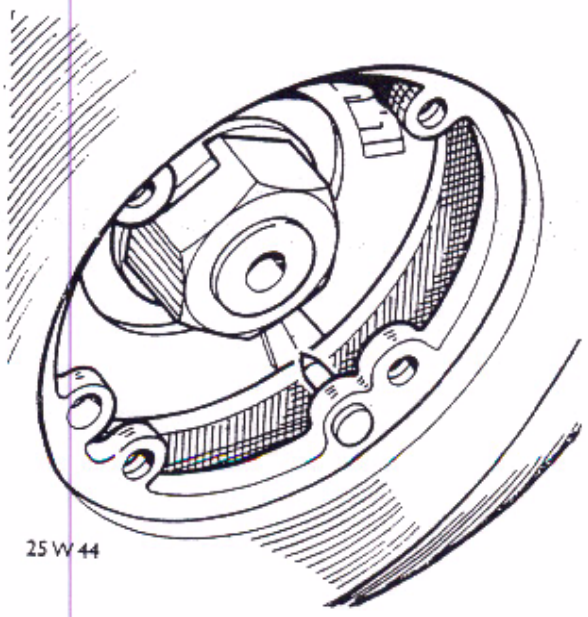

Fig. B35. Showing rotor marking

rotor. It will be seen that a timing mark is 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. B35).

Rotate the engine slowly until the pointer coincides with the timing mark to obtain the correct piston setting.

At this stage the auto-advance unit should be freed from its taper and rotated until the contact points are about to open. 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.

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

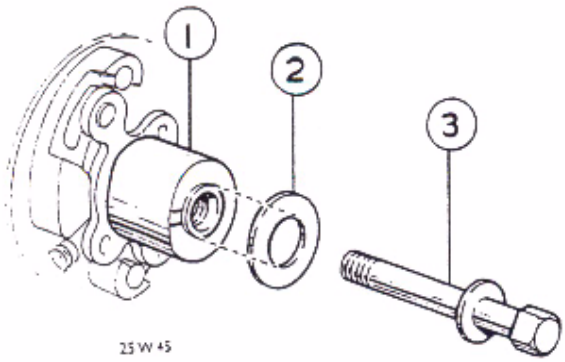

Fig. B36. Setting the contact breaker cam

Carefully remove the central fixing bolt (3) with washer from the contact breaker cam (2) and temporarily fit another washer (1) having a hole just large enough to clear the cam inner bearing (see Fig. B36), 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.

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. B37).

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 lights will go out.

Loosen the contact breaker plate pillar bolts and rotate the plate either backwards or forwards until the points are just opening.

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.

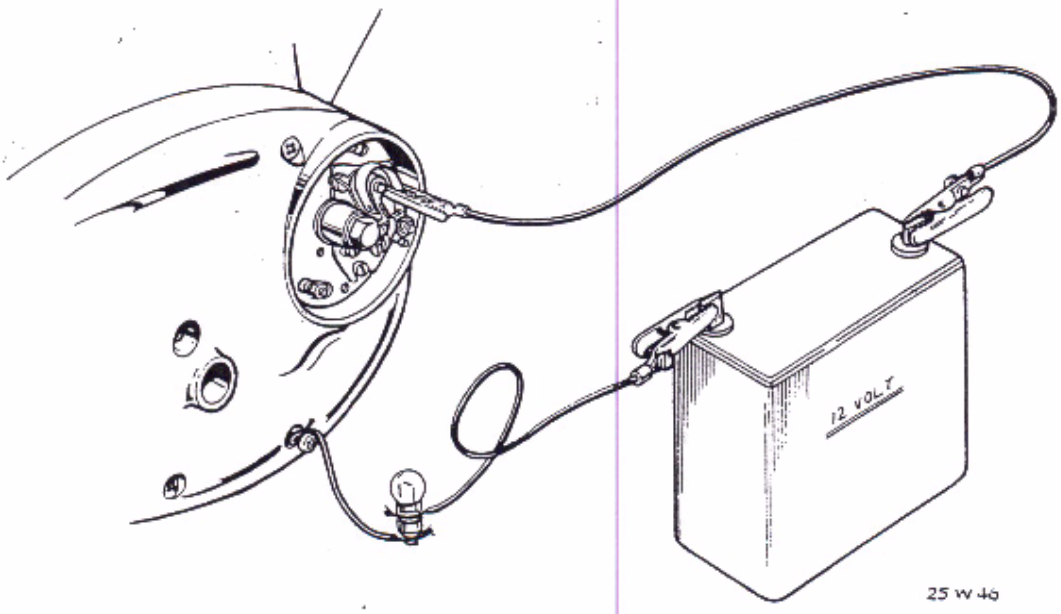

Fig. B37. Battery and bulb in circuit

Many dealers possess stroboscopic equipment especially designed for setting the ignition 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 small inspection cover at the forward end of the primary drive case expose the generator rotor and ignition pointer.

Connect the strobelight to a suitable 6 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 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.

A minute degree of adjustment can also be obtained by altering the contact points gap. By increasing the gap by .001 in. the timing will be advanced by 1 degree. By closing the gap by .001 in. the timing will be retarded by 1 degree.

SECTION C

CARBURETTER

INDEX

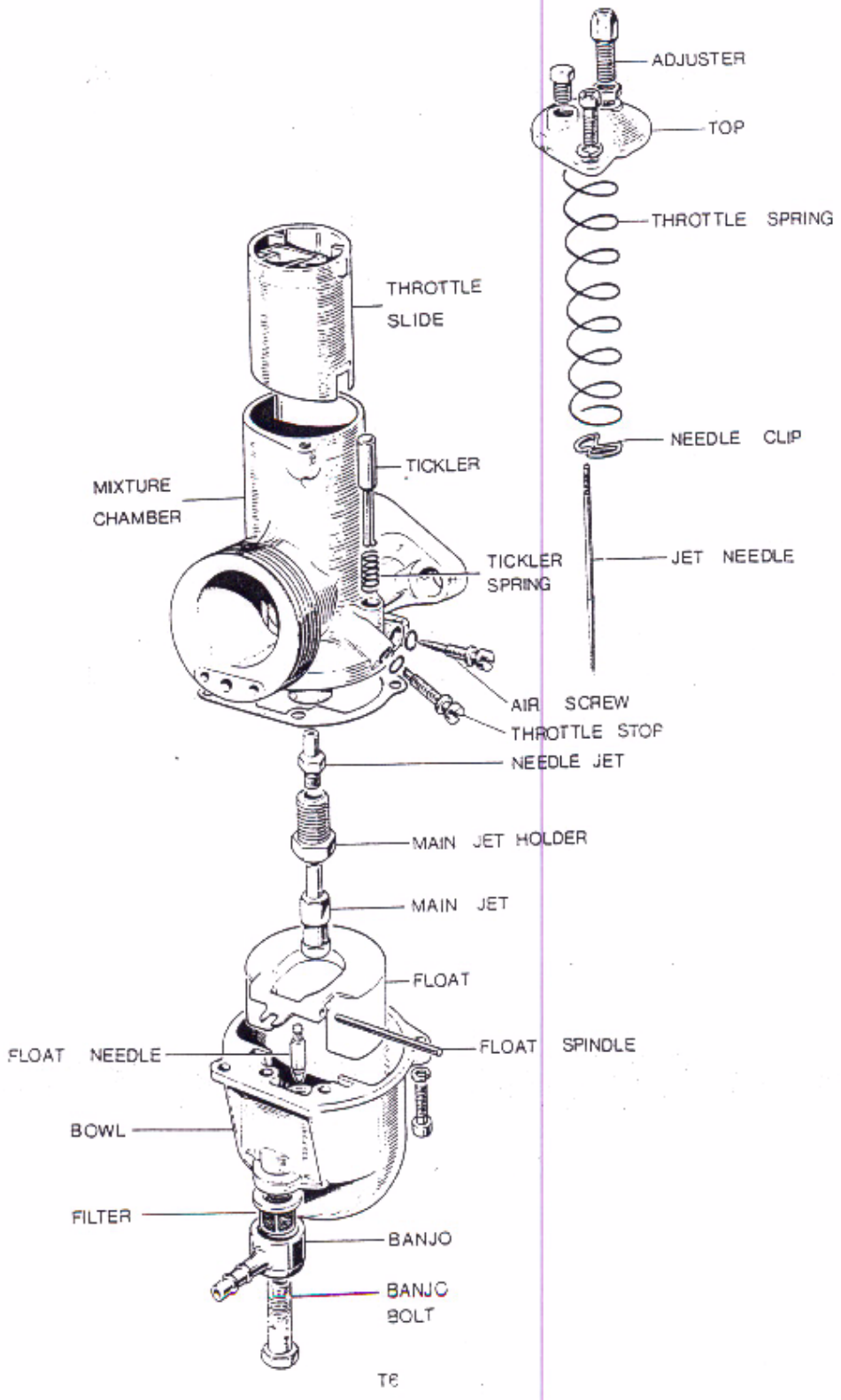

Fig. C1. Carburetter exploded

DESCRIPTION

The TR25W is fitted with an amal carburetter, 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 ultimately 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 by a pressed in pilot jet. As the throttle is opened, via the pilot by-pass, the pilot mixture is augmented by the supply from the main jet; the initial stages being controlled by the taper needle in the needle jet.

The pilot 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 through the primary air choke, into the main air choke. This primary air choke 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

Unscrew the air filter, release the two fixing nuts and 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 valve 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 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