BSA

WORKSHOP MANUAL

# VICTOR SERIES MODEL B44

1966, 1967 and 1968 MODELS
REVISED EDITION

# BSA

# WORKSHOP MANUAL

## FOR B44 MODELS

## VICTOR GRAND PRIX

## VICTOR ENDURO

## VICTOR SPECIAL (1967)

## VICTOR SPECIAL (1968)

**Service Department**
**B.S.A. MOTOR CYCLES LTD.**
**BIRMINGHAM 11,**

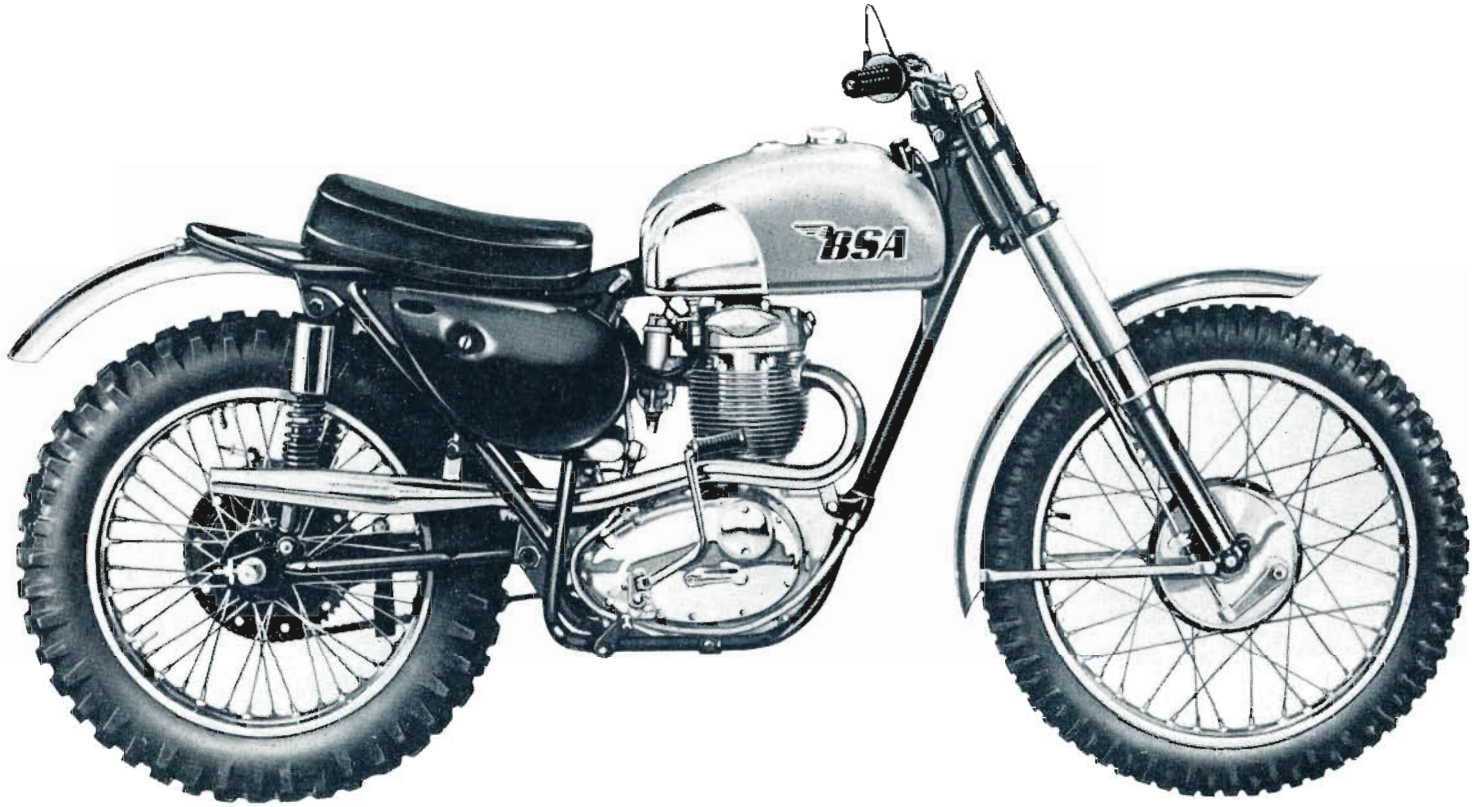
Telephone **021-772-2381**
**ARMOURY ROAD**

Publication Reference No. 00-4128/0/00.

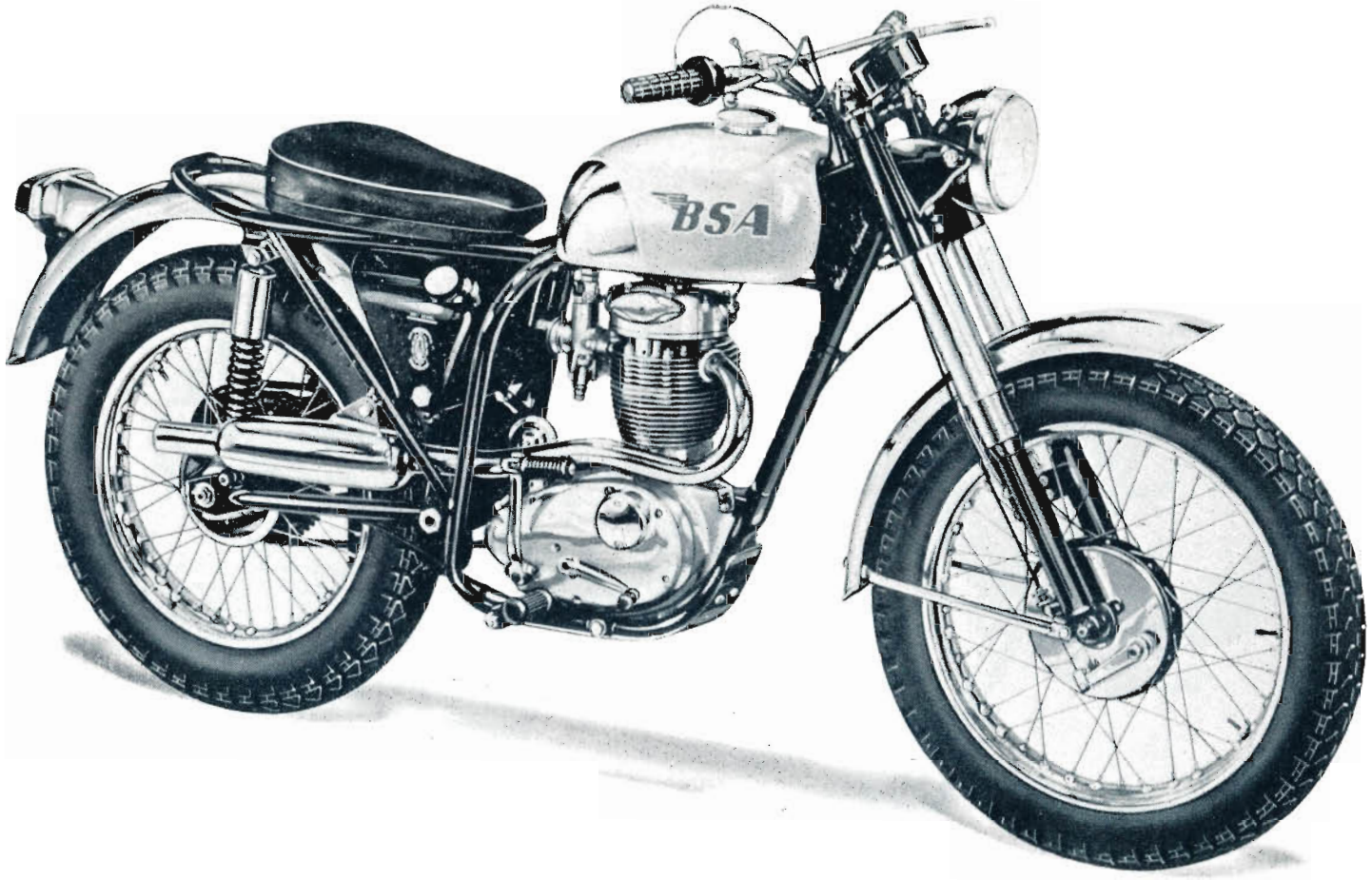
# Please Note!

**Replacement parts or accessories must be of B.S.A. origin or as approved by B.S.A. Motor Cycles Ltd.**

**In this respect your attention is drawn to the Terms and Conditions of B.S.A. Guarantee.**




# BSA 441 c.c. VICTOR GRAND PRIX

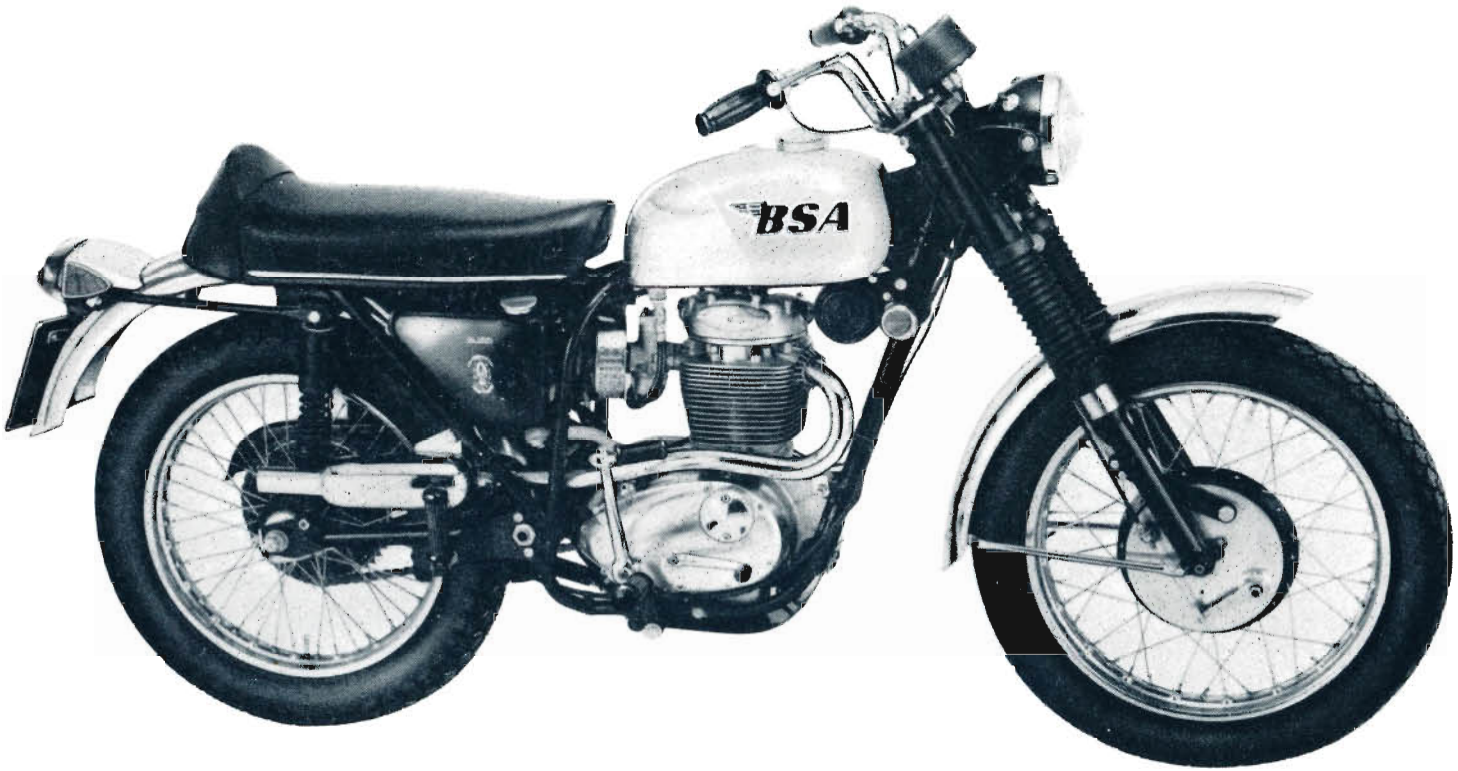



# BSA 441 c.c. VICTOR ENDURO/VICTOR SPECIAL (1966)

PRIOR TO ENGINE AND FRAME NUMBER B44 EA.101


# BSA 441 c.c. VICTOR ENDURO/VICTOR SPECIAL (1967)

COMMENCING ENGINE AND FRAME NUMBER B44 EA·101




# BSA 441 c.c. VICTOR ENDURO/VICTOR SPECIAL (1968)

# INTRODUCTION

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

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

All information and data given in this manual is correct at the time of publication but because of the constant development of B.S.A. motor cycles, changes in the specifications are inevitable.

Anyone finding this manual to be at variance with the B.S.A. machine in his possession is advised to contact the Service Department, where up-to-date information will be quickly provided.

# ENGINE AND FRAME NUMBERS

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

The engine number is stamped on the left-hand side of the crankcase immediately below the cylinder base. The frame number is stamped on the left-hand steering head support plate, just forward of and below the fuel tank.

# FACTORY SERVICE ARRANGEMENTS

**UNITED KINGDOM**

## REPLACEMENT PARTS

B.S.A. replacement parts and exchange units are distributed through a national network of B.S.A. dealers, each of whom holds a stock of fast moving parts. Approximately 200 of these dealers have been selected for appointment as specialist B.S.A. replacement part stockists and each of these stockists holds a comprehensive stock of B.S.A. replacement parts.

A complete list of appointed stockists is printed at the end of this manual, and also in every B.S.A. Parts Catalogue.

## REPAIRS

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

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

Should your B.S.A. dealer decide that Service Department attention is required he will know best how to make suitable arrangements with the factory. It is important to remember that no machine can be accepted at the Works without a prior appointment. This appointment can be made either by letter or by telephone.

## GUARANTEE CLAIMS

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

## TECHNICAL ADVICE

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

B.S.A. MOTOR CYCLES LIMITED,
SERVICE DEPARTMENT,
ARMOURY ROAD,
BIRMINGHAM 11.

*Telephone No.* 021–772–2381

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**In all communications the model must be quoted with full engine and frame numbers together with all prefix or suffix letters.**

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## WORLD SERVICE ARRANGEMENTS

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

The names of these distributors will be found at the back of this manual, and are also listed in all B.S.A. Replacement Part Catalogues.

## PROPRIETARY PARTS

Equipment not of our manufacture which is fitted to our motor cycles is of the highest quality and is guaranteed by the manufacturers and not by us. Any complaints or repairs should be sent to the manufacturer concerned or their accredited agents who will give every possible assistance. The following are the manufacturers concerned:—

| | |
|---|---|
| CARBURETTERS | Amal Limited,<br>Holdford Road,<br>Witton, BIRMINGHAM 6. |
| CHAINS | Renold Chains Limited,<br>Wythenshawe,<br>MANCHESTER. |
| ELECTRICAL EQUIPMENT | Joseph Lucas Limited,<br>Gt. Hampton Street,<br>BIRMINGHAM 18. |
| | Wipac Group Sales Limited,<br>London Road,<br>BUCKINGHAM. |
| REAR DAMPERS | Girling Limited,<br>Birmingham Road,<br>WEST BROMWICH, Staffs. |
| SPARK PLUGS | Champion Sparking Plug Company Limited,<br>Feltham,<br>Middlesex. |
| SPEEDOMETERS | Smith's Motor Accessories Limited,<br>Cricklewood Works,<br>LONDON N.W.2. |
| TYRES | Dunlop Rubber Company Limited,<br>Fort Dunlop,<br>BIRMINGHAM 24. |

## U.S.A. SERVICE ARRANGEMENTS

*REPLACEMENT PARTS*

*B.S.A. replacement parts are available through a National Network of B.S.A. dealers covering the entire United States.*

*These B.S.A. motor cycle dealers are listed under "Motorcycles" in the yellow pages of your local telephone directory.*

*All requests for parts must be made through franchised B.S.A. dealers, they are not sold direct to B.S.A. owners by the two factory branches.*

*GUARANTEE CLAIMS*

*In the interest of all concerned the owner of a new motorcycle wishing to claim assistance under the guarantee must do so through the dealer from whom his machine was purchased.*

*REPAIRS*

*B.S.A. dealers are capable of servicing and repairing B.S.A. motorcycles, ask your dealer to help when repairs are needed.*

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

*TECHNICAL ADVICE*

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

*The Factory Branch Addresses are shown below:—*

EASTERN — B.S.A. INCORPORATED,
639 Passaic Avenue,
Nutley,
NEW JERSEY 07110.

WESTERN — B.S.A. MOTORCYCLES — WESTERN,
2745 E Huntington Drive,
Duarte, CALIFORNIA 91010.

*In all communications the full engine and frame numbers with all prefix and suffix letters and figures must be quoted as well as the year and model of the motorcycle in question*

## WORLD DISTRIBUTORS

## REMOVING THE MOTORCYCLE FROM THE CASE

NOTE.—Check that the packing case is the RIGHT SIDE UP before dismantling The TOP has stencilled markings on it, the bottom does not·

1 Prise off the top boards with a suitable pinch bar

2 Take out the top packing and loose parts from around the motorcycle

3 Remove one side of the case and take out the motorcycle and any remaining loose parts. Check that you have all the small parts before discarding the wrappings. Retain the **Test Card** in case you find it necessary to report any loss of parts or damage during transit.

## FITTING THE FRONT MUDGUARD AND WHEEL

1. Put the machine on the prop stand and place a suitable support under the engine.

2. Locate the front mudguard between the fork legs and fit the braces.

3. Pull out the wheel spindle from the fork ends and fit the front wheel. Insert the spindle from the left-hand side and use a suitable bar to screw the spindle right home. The spindle has a left-hand thread.

4. Check that the brake plate stop is correctly located in its recess at the rear of the right-hand fork leg.

5. Depress the forks once or twice to enable the left-hand fork end to position itself on the spindle before finally tightening the pinch bolt. If this precaution is not observed. the fork leg may be clipped out of position and will not function correctly.

6. The support can now be removed from under the engine.

## FITTING THE HANDLEBAR AND ATTACHING THE CABLES

1. Place the handlebar in position, fit the handlebar clips and after adjusting for suitable position secure with the four fixing bolts.

2. Feed the cables through the appropriate guides and re-position the control levers.

3. Attach the clutch, front brake, and exhaust valve lifter cables to their respective levers. The front brake cable will be found among the loose parts and must also be connected at the front brake.

4. Fit the throttle control complete with cable and tighten the fixing screws.

5. Check each control for correct operation and adjust as necessary.

## FITTING THE SILENCER

1. Locate the silencer with clip, over the end of the exhaust pipe.

2. Secure to the frame bracket with the nut and bolt and tighten the clip firmly on to the pipe.

## FITTING THE REAR LIGHT

1. Pass the rear light cables through the hole in the mudguard and connect each cable to its respective snap connector.

2. Locate rear light on the mudguard and fix loosely at the top with one nut from below the guard.

3. Position the number plate bracket over the lower rear light fixing holes, fit the two bolts with nuts and tighten securely.

4. Finally, tighten the top fixing nut and check the cables.

## SPARK PLUG, TYRE PUMP AND TOOLS

1. Take out and discard the plastic plug from the spark plug hole, fit the spark plug and connect the high-tension lead. The plug supplied with the machine is best suited to all-round operating conditions and should not be changed without the advice of a plug specialist.

2. Snap the tyre pump into its mount below the saddle on the right-hand side of the frame.

3. The tools, instruction manual and other literature can now be placed to one side.

## FINAL CHECK

It is the duty of the dealer to see that every nut, bolt and screw is tight and correctly fitted before the motor cycle leaves his shop. The dealer is responsible if a customer returns and complains of rattles, missing nuts or fractures caused by vibration. It should be noted that 90% of all vibration problems can be traced to loose engine mountings. Do not simply take it for granted that the factory has done everything right. Take the precaution of **checking everything yourself.**

## STARTING THE MOTOR CYCLE

Fill the oil tank, primary drive and gearbox to the required levels with correct grades of oil (see page A.3).

Before starting the engine, make sure that there is no packing material in or around the carburetter air intake.

While the engine is running, take off the oil tank filler cap and check that the oil is circulating correctly through the return pipe. After replacing the oil tank cap the machine will be complete and ready for use.

## CONTENTS

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**NOTE**

Items applicable to Victor Enduro and Victor Special (U.S.A.) models only are marked with an asterisk. For details of corresponding items used on Victor Grand Prix models, refer to pages GD.10 to GD.12.

## ENGINE

### *PISTON

| | | |
|---|---|---|
| Material ... ... ... ... ... | "Lo-Ex" Aluminium | |
| Compression ratio ... ... ... ... | 9.4 : 1 | |
| Clearance (bottom of skirt) ... ... ... | .003"—.0035" | (.0762—.0889 mm.) |
| Clearance (top of skirt) ... ... | .006"—.0065" | (.1524—.1651 mm.) |
| (both measured on major axis). | | |

### *PISTON RINGS

| | | |
|---|---|---|
| Material—compression (top) ... ... ... | Brico BSS.5004 (chrome-plated) | |
| —compression (centre) ... ... | Brico 8 | |
| —†compression (top and centre) ... | Brico 8 (tapered) | |
| —scraper ... ... ... ... | Brico BSS.5004 | |
| Width—compression (top and centre) ... | .0625" | (1.5875 mm.) |
| Width—scraper ... ... ... ... | .125" | (3.175 mm.) |
| Depth ... ... ... ... ... ... | .120"—.127" | (3.048—3.2258 mm.) |
| Clearance in groove ... ... ... ... | .001"—.002" | (.0254—.0508 mm.) |
| Fitted gap (maximum) ... ... ... | .014" | (.3556 mm.) |
| Fitted gap (minimum) ... ... ... | .009" | (.2283 mm.) |

### OIL PUMP

| | | |
|---|---|---|
| Pump body material ... ... ... ... | Zinc base alloy | |
| Type ... ... ... ... ... ... | Double gear | |
| Drive ratio ... ... ... ... ... | 5 : 1 | †4 : 1 |
| Non-return valve spring (free length) ... | .5" | (12.7 mm.) |
| Non-return valve spring ball (diameter) ... | .25" | (6.35 mm.) |
| Oil pressure relief valve spring (free length) | .6094" | (15.4781 mm.) |
| Oil pressure relief valve ball (diameter) ... | .3125" | (7.9375 mm.) |

### *CAMSHAFT

| | | |
|---|---|---|
| Journal diameter (left-hand) ... ... ... | .5598"—.5603" | (14.2189—14.2316 mm.) |
| Journal diameter (right-hand) ... ... | .7480"—.7485" | (18.9992—19.0119 mm.) |
| Cam lift (inlet) ... ... ... ... ... | .345" | (8.763 mm.) |
| Cam lift (exhaust) ... ... ... ... | .336" | (8.534 mm.) |
| Base circle radius ... ... ... ... | .386" | (9.8044 mm.) |

### CAMSHAFT BEARING BUSHES

| | | |
|---|---|---|
| Bore diameter (fitted) left-hand ... ... | .561"—.562" | (14.2494—14.2748 mm.) |
| Bore diameter (fitted) right-hand ... ... | .7492"—.7497" | (19.0297—19.04238 mm.) |
| Outside diameter (left-hand) ... ... ... | .719"—.720" | (18.2626—18.2880 mm.) |
| Outside diameter (right-hand) ... ... | .908"—.909" | (23.0632—23.0886 mm.) |
| Camshaft clearance (left-hand) ... ... | .0012"—.0017" | (.03048—.0432 mm.) |
| Camshaft clearance (right-hand) ... ... | .0012" | (.03048 mm.) |

†Applicable to 1968 Victor Special.

## VALVES

| | | |
|---|---|---|
| Seat angle (inclusive) | 90° | |
| Head diameter (inlet) | 1.535″—1.540″ | (38.9890—39.1160 mm.) |
| Head diameter (exhaust) | 1.407″—1.412″ | (35.737—35.864 mm.) |
| Stem diameter (inlet) | .3095″—.3100″ | (7.861—7.874 mm.) |
| Stem diameter (exhaust) | .3090″—.3095″ | (7.848—7.861 mm.) |

## VALVE GUIDES

| | | |
|---|---|---|
| Material | Phosphor Bronze | |
| Bore diameter | .3120″—.3130″ | (7.9248—7.950 mm.) |
| Outside diameter | .5005″—.5010″ | (12.7127—12.7254 mm.) |
| Length | 1.859″ | (47.2186 mm.) |
| Cylinder head interference fit | .0005″—.0025″ | (.0127—.0635 mm.) |

## VALVE SPRINGS

| | | |
|---|---|---|
| Free length (inner) | 1.500″ | (38.10 mm.) |
| Free length (outer) | 1.670″ | (42.418 mm.) |
| Fitted length (inner) | 1.218″ | (30.9372 mm.) |
| Fitted length (outer) | 1.312″ | (33.3248 mm.) |

## *VALVE TIMING

Tappets set to .015″ (.381 mm.) for checking purposes only.

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

## *TAPPET CLEARANCE (Cold)

| | | |
|---|---|---|
| Inlet | .008″ | (.2032 mm.) |
| Exhaust | .010″ | (.254 mm.) |

## IGNITION TIMING

| | | |
|---|---|---|
| Piston position (B.T.D.C.) fully advanced | .2656″ | (6.7469 mm.) |
| Crankshaft position (B.T.D.C.) fully advanced | 28° | |
| Contact breaker gap setting | .015″ | (.381 mm.) |

## SPARK PLUG

| | | |
|---|---|---|
| Type | Champion N64Y | †Champion N6Y |
| Gap setting | .020″ min.—.025″ max. | (.508—.635 mm.) |
| Thread size | 14 mm. dia. × .75″ reach. | (19.05 mm.) |

†Applicable to 1968 Victor Special.

## *CYLINDER BARREL

| | | |
|---|---|---|
| Material ... ... ... ... ... | Aluminium with austenitic iron liner | |
| Bore size (standard) ... ... ... ... | 79 mm. | |
| Stroke ... ... ... ... ... ... | 90 mm. | |
| Oversizes ... ... ... ... ... | .010″ & .020″ | (.254 & .508 mm.) |

## CYLINDER HEAD

| | | |
|---|---|---|
| Material ... ... ... ... ... | Aluminium alloy | |
| Inlet port size ... ... ... ... .. | 1.0625″ | (26.9875 mm.) |
| Exhaust port size ... ... ... ... | 1.376″—1.378″ | (34.9504—35.0012 mm.) |
| †Inlet port size ... ... ... ... ... | 1.125″ | (28.575 mm.) |
| †Exhaust port size ... ... ... ... | 1.250″ | (31.75 mm.) |

## *CARBURETTER (fitted up to Engine No. B44EA.101)

| | | |
|---|---|---|
| Type ... ... ... ... ... ... | Amal 389/235 | |
| Main jet ... ... ... ... ... | 330 | |
| Pilot jet ... ... ... ... ... ... | 25 | |
| Needle jet size ... ... ... ... ... | .106″ | (2.6924 mm.) |
| Needle position ... ... ... ... | 3 | |
| Throttle valve ... ... ... ... ... | 3½ | |
| Nominal choke size ... ... ... ... | 1.15625″ | ('9.3687 mm.) |
| Throttle slide return spring (free length) ... | 2.5″ | (63.5 mm.) |

## *CARBURETTER (fitted on and after Engine No. B44EA.101)

| | | |
|---|---|---|
| Type ... ... ... ... ... ... | Amal 930/1 (concentric float chamber) | |
| Main jet ... ... ... ... ... | 220 | |
| Pilot jet ... ... ... ... ... ... | 25 | |
| Needle jet size ... ... ... ... ... | .107″ | (2.7178 mm.) |
| Needle position ... ... ... ... | 2 | |
| Throttle valve ... ... ... ... ... | 3 | |
| Nominal choke size ... ... .. ... | 30 mm. | |
| Throttle slide return spring (free length) ... | 2.5″ | (63.5 mm.) |

## BEARING DIMENSIONS

| | | |
|---|---|---|
| Clutch roller (25) ... ... ... ... | .1875″ × .1875″ | (4.7025 mm. × 4.7025 mm.) |
| Con-rod big-end bush (bore) ... ... ... | 1.7701″—1.7706″ | (44.9605—44.9732 mm.) |
| Con-rod big-end roller (24) ... ... ... | .250″ dia. × .250″ | (6.35 mm. × 6.35 mm.) |
| Con-rod small-end bush (bore) ... ... | .7503″—.7506″ | (19.0576—19.0652 mm.) |
| Crankshaft bearing (drive-side) ... ... | 25 × 62 × 17 mm. | |

†Applicable to 1968 Victor Special.

## BEARING DIMENSIONS—*continued*

| | | |
|---|---|---|
| Crankshaft bearing (gear-side) ... ... | 25 × 62 × 17 mm. | |
| Crankshaft diameter (drive-side & gear-side) | .9841″—.9844″ | (24.9961—25.0038 mm.) |
| Gearbox layshaft bearings (drive-side & gear-side) ... ... ... ... ... | 0.5″ × .625″ × .8125″ | (12.7 × 15.875 × 20.6375 mm.) |
| Gearbox layshaft diameter (drive-side & gear-side) ... ... ... ... ... | .6245″—.625″ | (15.8623—15.8750 mm.) |
| Gearbox mainshaft bearing (drive-side) ... | 30 × 62 × 16 mm. | |
| Gearbox mainshaft bearing (gear-side) ... | .625″ × 1.5625″ × .4375″ | (15.875 × 39.2875 × 11.1125 mm.) |
| Gearbox mainshaft diameter (drive-side) ... | .7485″—.749″ | (19.0119—19.0246 mm.) |
| Gearbox mainshaft diameter (gear-side) ... | .6245″—.625″ | (15.8623—15.8750 mm.) |
| Gearbox sleeve pinion (internal diameter) ... | .752″—.753″ | (19.1008—19.1262 mm.) |
| Gearbox sleeve pinion (external diameter) ... | 1.179″—1.180″ | (29.9466—29.9720 mm.) |
| Gudgeon pin diameter ... ... ... | .750″—.7502″ | (19.05—19.055 mm.) |

# TRANSMISSION

## CLUTCH

| | | |
|---|---|---|
| Type ... ... ... ... ... ... | Multi-plate with integral cush drive | |
| Number of plates: | | |
| Driving (bonded segments) ... ... | 4 | |
| Driven (plain) ... ... ... ... | 5 | |
| Overall thickness of driving plate & segments | .167″ | (4.242 mm.) |
| Clutch springs ... ... ... ... ... | 4 | |
| Free length of springs ... ... ... ... | 1.65685″ | (42.0687 mm.) |
| Clutch push rod (length) ... ... ... | 9.0″ | (228.6 mm.) |
| Clutch push rod (diameter) ... ... ... | .1875″ | (4.7025 mm.) |

## *GEAR RATIOS

| | | |
|---|---|---|
| Gearbox—top ... ... ... ... ... | 1.0 | |
| —third ... ... ... ... | 1.24 | |
| —second ... ... ... ... | 1.65 | |
| —first ... ... ... ... ... | 2.65 | |
| | *Prior to engine No. B44EA.101.* | *On and after engine No. B44EA.101.* |
| Overall—top ... ... ... ... ... | 5.36 | 5.33 |
| —third ... ... ... ... ... | 6.65 | 6.61 |
| —second ... ... ... ... | 8.84 | 8.79 |
| —first ... ... ... ... ... | 14.20 | 14.12 |
| †Overall—top ... ... ... ... ... | 5.36 | |
| —third ... ... ... ... ... | 6.65 | |
| —second ... ... ... ... | 8.84 | |
| —first ... ... ... ... ... | 14.20 | |

†Applicable to 1968 Victor Special.

## *SPROCKETS

| | |
|---|---|
| Engine ... ... ... ... ... ... | 28 teeth |
| Clutch ... ... ... ... ... ... | 52 teeth |
| Gearbox (prior to engine No. B44EA.101) ... | 18 teeth |
| Rear wheel (prior to engine No. B44EA.101) | 52 teeth |
| †Gearbox (on and after engine No. B44EA.101) | 17 teeth |
| †Rear wheel (on & after engine No. B44EA.101) | 49 teeth |

## *CHAIN SIZES

| | |
|---|---|
| Primary ... ... ... ... ... ... | Duplex .375″ × 70 pitches |
| Transmission (prior to engine No. B44EA.101) | .5″ × 127 pitches |
| Transmission (on & after engine No. B44EA.101) | 0.625″ × 100 pitches |

# FRAME AND FITTINGS

## *FRONT FORKS

| | | |
|---|---|---|
| Type ... ... ... ... ... ... | Coil-spring (hydraulically damped) | |
| Springs—free length ... ... ... ... | 10.75″—10.875″ | (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″ | (213.36 mm.) |
| —spring rate ... ... ... ... | 100 lb./in. | |
| —colour identification ... ... | Green/pink | |

## SWINGING ARM

| | | |
|---|---|---|
| Bush type ... ... ... ... ... | Bonded rubber | |
| Bush diameter ... ... ... ... ... | 1.250″—1.253″ | (31.75—31.8262 mm.) |
| Housing diameter ... ... ... ... | 1.247″—1.248″ | (31.673—31.699 mm.) |
| Interference fit ... ... ... ... ... | .002″—.006″ | (.0508—.1524 mm.) |
| Spindle diameter ... ... ... ... | .810″—.811″ | (20.570—20.595 mm.) |

## FRONT FORK BUSHES

| | | |
|---|---|---|
| Outer diameter (top) ... ... ... ... | 1.4750″—1.4755″ | (37.465—37.477 mm.) |
| Outer diameter (bottom) ... ... ... | 1.473″—1.474″ | (37.414—37.439 mm.) |
| Inner diameter (top) ... ... ... ... | 1.250″—1.251″ | (31.750—31.755 mm.) |
| Inner diameter (bottom) ... ... ... | 1.2485″—1.2495″ | (31.711—31.737 mm.) |
| Working clearance (top) ... ... ... | .0005″ | (.0127 mm.) |
| Working clearance (bottom) ... ... ... | .002″—.003″ | (.0508—.0762 mm.) |
| Length (top) ... ... ... ... ... | 2.125″ | (53.975 mm.) |
| Length (bottom) ... ... ... ... | 1.25″ | (31.75 mm.) |
| Shaft diameter ... ... ... ... ... | 1.248″—1.249″ | (31.699—31.7246 mm.) |
| Sliding tube bore diameter ... ... ... | 1.475″—1.477″ | (37.465—37.515 mm.) |
| Damper tube bush (outer diameter) ... ... | .6165″—.6185″ | (15.6591—15.7099 mm) |
| Damper tube bush (inner diameter) ... ... | .339″—.340″ | (8.6106—8.636 mm.) |
| Damper tube bush (length) ... ... ... | .53125″ | (13.4937 mm.) |

†Applicable to 1968 Victor Special.

## WHEELS, BRAKES AND TYRES

### *WHEELS

| | | |
|---|---|---|
| Rim size and type (front) ... ... ... | WM2–19 | |
| Rim size and type (rear) ... ... ... | WM3–18 | |
| Spoke sizes: | | |
| front (long) 20 ... ... ... ... | 10 SWG × 8.75″ | (3.251 × 222.25 mm.) |
| front (short) 20 ... ... ... ... | 10 SWG × 7.50″ | (3.251 × 190.50 mm.) |
| rear 40 (prior to frame No. B44EA.101) | 10 SWG × 5.9375″ | (3.251 × 150.8125 mm.) |
| †rear (long) 20 (on & after frame number B44EA.101) ... ... ... ... | 10 SWG × 7.4375″ | (3.251 × 188.9125 mm.) |
| †rear (short) 20 (on & after frame number B44EA.101) ... ... ... ... | 10 SWG × 7.375″ | (3.251 × 187.325 mm.) |

### *WHEEL BEARINGS (prior to Frame No. B44EA.101)

| | | |
|---|---|---|
| Front (left-hand and right-hand) ... ... | .875″ × .5625″ single seal | |
| Rear (left-hand) ... ... ... ... | 20 × 47 × 14 mm. | |
| Rear (right-hand) ... ... ... ... | 17 × 40 × 12 mm. | |
| Spindle diameter (front) ... ... ... | .8740″—.8745″ | (22.199—22.212 mm.) |
| Spindle diameter (rear, left-hand) ... ... | .7868″—.7873″ | (19.984—19.997 mm.) |
| Spindle diameter (rear, right-hand) ... ... | .6686″—.6690″ | (16.982—16.993 mm.) |

### †WHEEL BEARINGS (on and after Frame No. B44EA.101)

Details as Victor Grand Prix model (page GD.11)

### *BRAKES

| | | |
|---|---|---|
| Front (diameter) ... ... ... ... | 7″ | (177.8 mm.) |
| Front (width) ... ... ... ... ... | 1.125″ | (28.575 mm.) |
| Rear (diameter) prior to frame No. B44EA.101 | 6″ | (152.4 mm.) |
| Rear (width) prior to frame No. B44EA.101 | 0.875″ | (22.225 mm.) |
| †Rear (diameter) on & after frame number B44EA.101 ... ... ... ... | 7″ | (177.8 mm.) |
| †Rear (width) on & after frame No. B44EA.101 | 1.125″ | (28.575 mm.) |
| Lining thickness (front and rear) ... ... | .15625″ | (3.9687 mm.) |
| Lining area sq./in. (sq./cm.)—front ... ... | 15.48 (99.84) | |
| rear (prior to frame No. B44EA.101) ... | 10.12 (65.292) | |
| †rear (on & after frame No. B44EA.101) | 15.48 (99.84) | |

### *TYRES

| | | |
|---|---|---|
| Size (front) ... ... ... ... ... | 3.25″ × 19″ | (82.55 × 482.6 mm.) |
| Size (rear) ... ... ... ... ... | 4.00″ × 18″ | (101.6 × 457.2 mm.) |
| Pressure (front and rear) ... ... ... | 16 p.s.i. (1.125 Kg/sq. cm.) | |

### *ELECTRICAL EQUIPMENT (6-volt — Energy Transfer)

| | |
|---|---|
| Alternator type ... ... ... ... | Lucas RM.19ET |
| Contact breaker ... ... ... ... | Lucas 4CA |
| Coil ... ... ... ... ... ... | Lucas 3ET |
| Bulbs (headlight) ... ... ... ... | 30/24 watt |
| Bulbs (stop/tail light) ... ... ... ... | 6/18 watt |
| Bulbs (speedometer light) ... ... ... | 3 watt |

†Applicable to 1968 Victor Special.

## †ELECTRICAL EQUIPMENT (12 volt)

| | |
|---|---|
| Battery ... ... ... ... ... ... | Lucas PUZ5A |
| Coil ... ... ... ... ... ... | Lucas MA.12 |
| Contact breaker unit (B44 models) ... ... | Lucas 54041073 |
| Generator ... ... ... ... ... | Lucas RM.21 |
| 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 ... ... ... ... ... | 1¾ galls./2 U.S. | (8 litres) |
| Fuel tank ... ... ... ... ... | 2 galls. /2.34 U.S. | (9.092 litres) |
| Oil tank ... ... ... ... ... | 5 pints/6 U.S. | (2.841 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 ... ... ... ... ... | 52″ | (132 cm.) |
| Wheelbase ... ... ... ... ... | 53″ | (134.62 cm.) |
| Overall length ... ... ... ... ... | 82″ | (208.28 cm.) |
| Handlebar width ... ... ... ... | 32″ | (81.28 cm.) |
| Seat height ... ... ... ... ... | 32″ | (81.28 cm.) |
| Ground clearance ... ... ... ... | 8″ | (20.32 cm.) |
| †Ground clearance ... ... ... ... | 8 5/16″ | (21.4 cm.) |

## *WEIGHTS

| | | |
|---|---|---|
| †Machine unladen ... ... ... ... | 306 lb. | (139 Kg.) |
| Machine unladen ... ... ... ... | 288 lb. | (130 Kg.) |
| Engine/gearbox unit (less carburetter) ... | 85 lb. | (39 Kg.) |

†Applicable to 1968 Victor Special.

## PISTON DISPLACEMENT AND CRANKSHAFT DEGREES

| Degrees | Piston Displacement | | Degrees | Piston Displacement | | Degrees | Piston Displacement | |
|---|---|---|---|---|---|---|---|---|
| | Inches | mm. | | Inches | mm. | | Inches | mm. |
| 1 | .0005 | .0127 | 16 | .0901 | 2.28854 | 31 | .3227 | 8.19658 |
| 2 | .0014 | .03356 | 17 | .0999 | 2.53746 | 32 | .3433 | 8.71982 |
| 3 | .0033 | .08382 | 18 | .1117 | 2.83718 | 33 | .3638 | 9.24052 |
| 4 | .0056 | .14224 | 19 | .1243 | 3.15722 | 34 | .3853 | 9.78662 |
| 5 | .0088 | .22352 | 20 | .1376 | 3.49504 | 35 | .4056 | 10.30224 |
| 6 | .0127 | .32258 | 21 | .1514 | 3.84556 | 36 | .4296 | 10.91184 |
| 7 | .0171 | .43434 | 22 | .1658 | 4.21132 | 37 | .4522 | 11.48588 |
| 8 | .0223 | .56642 | 23 | .1810 | 4.5974 | 38 | .4756 | 12.08024 |
| 9 | .0283 | .71882 | 24 | .1968 | 4.99872 | 39 | .4905 | 12.4587 |
| 10 | .0349 | .88646 | 25 | .2129 | 5.40766 | 40 | .5236 | 13.29944 |
| 11 | .0421 | 1.06934 | 26 | .2297 | 5.83438 | 41 | .5483 | 13.92682 |
| 12 | .0501 | 1.27254 | 27 | .2473 | 6.28142 | 42 | .5734 | 14.56436 |
| 13 | .0586 | 1.48844 | 28 | .2607 | 6.62178 | 43 | .5988 | 15.20952 |
| 14 | .0680 | 1.7272 | 29 | .2839 | 7.21106 | 44 | .6250 | 15.8750 |
| 15 | .0781 | 1.98374 | 30 | .3032 | 7.70128 | 45 | .6512 | 16.54048 |

## VICTOR GRAND PRIX MODELS ONLY

All General Data is the same as that given in preceding pages for the Victor Enduro and Victor Special (U.S.A.) models, except for the following:

### ENGINE

**PISTON**

| | | |
|---|---|---|
| Compression ratio ... ... ... ... | 11.4 : 1 | |

**PISTON RINGS**

| | | |
|---|---|---|
| Material —compression (top and centre) ... | Brico 8 | |

**CAMSHAFT**

| | | |
|---|---|---|
| Cam lift (inlet and exhaust) ... ... ... | .355" | (9.017 mm.) |

**VALVE TIMING**

Tappets set to .015" (.381 mm.):

| | |
|---|---|
| Inlet opens B.T.D.C. ... ... ... ... | 63° |
| Inlet closes A.B.D.C. ... ... ... ... | 72° |
| Exhaust opens B.B.D.C. ... ... ... | 80 |
| Exhaust closes A.T.D.C. ... ... ... | 55° |

**TAPPET CLEARANCE (Cold)**

| | | |
|---|---|---|
| Inlet and exhaust ... ... ... ... | .015" | (.381 mm.) |

**CYLINDER BARREL**

| | |
|---|---|
| Material ... ... ... ... ... | Chromium-plated "Y" alloy |
| Oversizes ... ... ... ... ... | Nil |

**CARBURETTER**

| | |
|---|---|
| Type ... ... ... ... ... ... | Amal 389/221 |
| Main jet ... ... ... ... ... | 260 |

### TRANSMISSION

**GEAR RATIOS**

| | |
|---|---|
| Gearbox—first ... ... ... ... ... | 2.18 |
| Overall—top ... ... ... ... ... | 6.97 |
| —third ... ... ... ... ... | 8.65 |
| —second ... ... ... ... | 11.42 |
| —first ... ... ... ... ... | 15.40 |

**SPROCKETS**

| | |
|---|---|
| Gearbox ... ... ... ... ... | 16 teeth |
| Rear wheel ... ... ... ... ... | 60 teeth |

## CHAIN SIZES

| | |
|---|---|
| Transmission ... ... ... ... ... | 0.5″ × 128 pitches |

## FRAME

### FRONT FORKS

| | | |
|---|---|---|
| Springs (free length) ... ... ... ... | 10.375″—10.50″ | (263.525—266.7 mm.) |
| Springs (spring rate) ... ... ... ... | 27 lb./in. | |
| Springs (number of coils) ... ... ... | 21½ | |
| Springs (colour identification) ... ... | Nil | |

## WHEELS, BRAKES AND TYRES

### WHEELS

| | | |
|---|---|---|
| Rim size and type (front) ... ... ... | WM1–20 | |
| Spoke sizes—front (long) 20 ... ... ... | 8 SWG × 9.25″ | (4.064 × 234.95 mm.) |
| Spoke sizes—front (short) 20 ... ... | 8 SWG × 8.0″ | (4.064 × 203.2 mm.) |
| Spoke sizes —rear (long) 20 ... ... ... | 10 SWG × 7.4375″ | (3.251 × 188.9125 mm.) |
| Spoke sizes—rear (short) 20 ... ... ... | 10 SWG × 7.375″ | (3.251 × 187.325 mm.) |

### WHEEL BEARINGS

| | | |
|---|---|---|
| Rear (left-hand and right-hand) ... ... | .875″ × 2″ × .5625″ single seal | |
| Rear brake drum ... ... ... ... | .875″ × 2″ × .5625″ double seal | |
| Spindle diameter (rear, left-hand) ... ... | .8745″—.8750″ | (22.212—22.225 mm.) |
| Spindle diameter (rear, right-hand) ... ... | .685″—.686″ | (17.399—17.424 mm.) |

### BRAKES

| | | |
|---|---|---|
| Rear (diameter) ... ... ... ... | 7″ | (177.8 mm.) |
| Rear (width) ... ... ... ... ... | 1.125″ | (28.575 mm.) |
| Lining thickness (rear) ... ... ... | .1875″ | (4.7025 mm.) |
| Lining area sq./in. (sq./cm.)—rear ... ... | 15.48 (99.84) | |

### TYRES

| | | |
|---|---|---|
| Size (front) ... ... ... ... ... | 3.00″ × 20″ | (76.2 × 508 mm.) |
| Pressure (front and rear) ... ... ... | To suit requirements | |

## ELECTRICAL EQUIPMENT

| | |
|---|---|
| Bulbs ... ... ... ... ... ... | Nil |

## CAPACITIES

| | |
|---|---|
| Fuel tank ... .. ... ... ... | 1.5 galls./1.875 U.S. (6.819 litres) |
| Oil system ... ... ... ... ... | 4.25 pints/5.3 U.S. (2.415 litres) |

## BASIC DIMENSIONS

| | | |
|---|---|---|
| Wheelbase ... ... ... ... ... | 52.75" | (133.985 cm.) |
| Overall length ... ... ... ... ... | 81.5" | (207.01 cm.) |

## WEIGHTS

| | |
|---|---|
| Machine unladen ... ... ... ... | 255 lbs. (114 Kg.) |
| Engine/gearbox (less carburetter) ... ... | 83 lbs. (37.5 Kg.) |

## INDEX

## ROUTINE MAINTENANCE

| *Ref. No.* | |
|---|---|
| | WEEKLY |
| 2. | Check Oil Level in Tank (Enduro and Special (U.S.A.) or System (Grand Prix). |
| 12. | Oil Brake Pedal Pivot. |
| 4. | Oil Exposed Cables and Control Rod Joints. |
| | EVERY 500 MILES (800 KM.) |
| 10. | Check Oil Level in Primary Chaincase. |
| | EVERY 2,000 MILES (3,200 KM.) |
| 2. | Drain and Refill the Oil Tank (Enduro and Special (U.S.A.) or System (Grand Prix). |
| 9. | Check Oil Level in Gearbox. |
| 2. | Clean the Oil Filters. |
| | Lubricate Prop Stand (Enduro and Special (U.S.A.) only). |
| 11. | Lubricate Front Brake Cam Spindle (Enduro and Special (U.S.A.): Grease (Grand Prix). |
| 5. | Lubricate Rear Brake Cam Spindle. |
| 1. | Lubricate Rear Chain. |
| | EVERY 5,000 MILES (8,000 KM.) |
| 6. | Grease Speedometer Drive (Enduro and Special (U.S.A.) only). |
| 3. | Lubricate Contact Breaker Cam. 1968 Models to be Lubricated Every 6,000 Miles. |
| 3. | Lubricate Auto-Advance Mechanism. |
| 9. | Drain and Refill Gearbox. |
| 10. | Drain and Refill Primary Chaincase. |
| | EVERY 10,000 MILES (16,000 KM.) |
| 13. | Drain and Refill Front Forks. |
| | Grease Wheel Bearings. |
| | Grease Steering Head Bearings. |

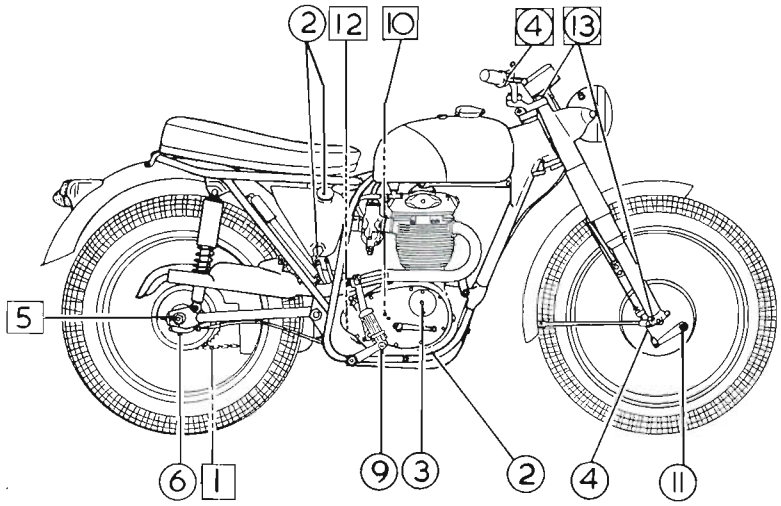


Fig. A.1. *Key lubrication points.* (Numbers in circles refer to right side of machine: numbers in squares refer to left side of machine).

If the machine is to be used solely for Competition purposes, routine maintenance must of course be carried out as often as possible. Oil level checks and oil changes should be made before every event.

## RECOMMENDED LUBRICANTS

### UNITED KINGDOM

| | Mobil | B.P. | Castrol | Esso | Shell | Regent |
|---|---|---|---|---|---|---|
| Victor Enduro & Special (U.S.A.) Engine & G/box: | | | | | | |
| Summer ... | BB | SAE 40 | XXL | Extra 40/50 | X100-40 | Havoline SAE 40 |
| Winter ... ... | Mobiloil Super | SAE 30 | XL | 20W/30 | X100-30 | SAE 30 |
| Victor Grand Prix Engine: (Vegetable base) | — | SAE 30 | R30 | — | R30 | — |
| Victor Grand Prix Gearbox: | — | 90 E.P. | 90 E.P. | — | 90 E.P. | — |
| Primary Chaincase ... | Arctic | SAE 20W | Castrolite | Extra 20W/30 | X100-20W | Havoline SAE 20W |
| Front Fork ... | Arctic | SAE 20W | Castrolite | Extra 20W/30 | X100-20W | Havoline SAE 20W |
| Wheel Bearings Swinging Arm Steering Head | Mobilgrease MP | Energrease L2 | Castrolease LM | Multi-purpose H | Retinax A | Marfak 2 |

### OTHER COUNTRIES

| | Mobil | B.P. | Castrol | Esso | Shell | Caltex |
|---|---|---|---|---|---|---|
| Victor Enduro & Special (U.S.A.) Engine & G/box | | | | | | |
| Above 32°C. | Mobil AF | Energol 40 | XXL | SAE 40/50 | X100-40 | SAE 40 |
| 0° to 32°C. ... | Mobiloil Super | Energol 30 | XL | SAE 20W/40 | X100-30 | SAE 30 |
| Below 0°C. ... | Mobil Arctic | Energol 20W | Castrolite | SAE 10W/30 | X100-20W | SAE 20W |
| Victor Grand Prix Engine (Vegetable base) | — | Energol 30 | R30 | — | R30 | — |
| Victor Grand Prix Gearbox | — | 90 E.P. | 90 E.P. | — | 90 E.P. | — |
| Primary Chaincase ... | Mobil Arctic | Energol 20 | Castrolite | SAE 20W/40 | X100-20W | SAE 20W |
| Front Fork | | | | | | |
| Above 32°C. | Mobiloil D | Energol 50 | Grand Prix | SAE 40 | X100-50 | SAE 50 |
| 15°C. to 32°C. | Mobiloil Super | Energol 30 | XL | SAE 20W/40 | X100-30 | SAE 30 |
| Below 15°C. | Mobiloil Arctic | Energol 20W | Castrolite | SAE 10W/30 | X100-20W | SAE 20W |
| Wheel Bearings Swinging Arm Steering Head | Mobilgrease MP | Energrease L2 | Castrolease LM | Multi-purpose H | Retinax A | Marfak 2 |

Special Note:-During factory testing, the Victor Grand Prix engine is run on a vegetable-base oil and a similar type of oil MUST be used thereafter. The Victor Enduro and Special (U.S.A.) engine however, is run on a mineral-base oil. If it is desired to change the type of 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.

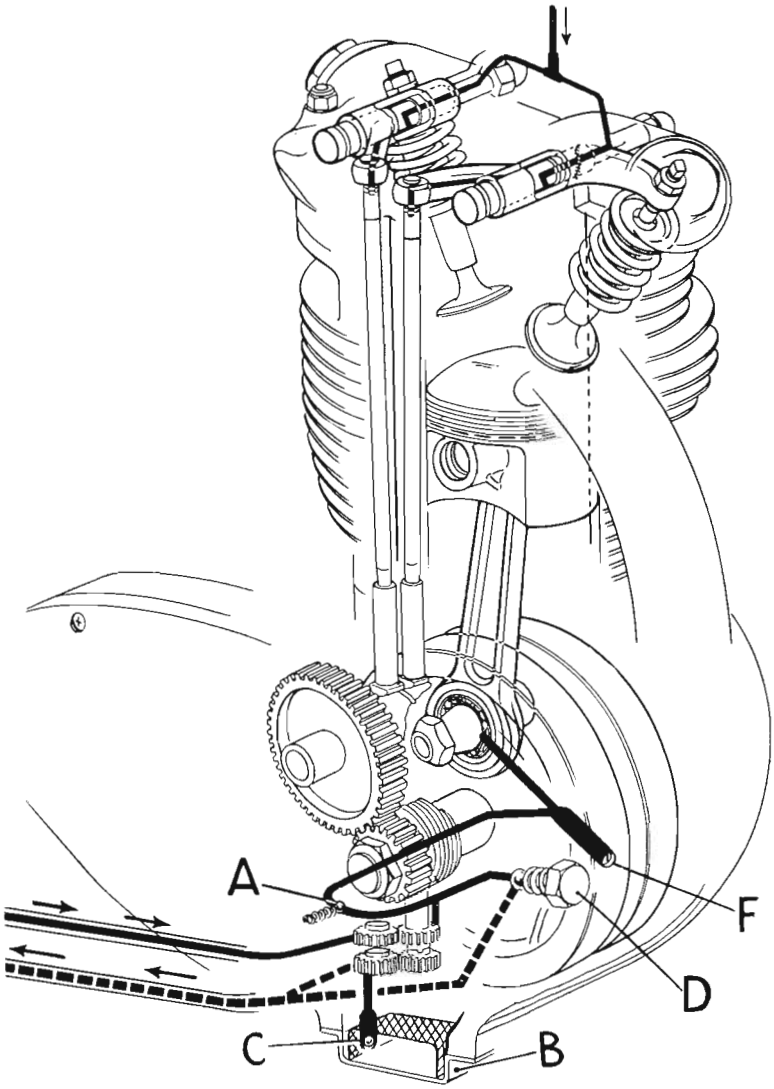


FIG. A.2. *Engine lubrication diagram showing the ball valves.*

## THE LUBRICATION SYSTEM

The 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. A.2).

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, onto the cylinder walls, 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 to provide a supply of oil at low pressure to the valve rocker gear. At the oil tank on models up to 1968. At the crankcase union on 1968 onwards.

This pipe is connected by means of a twin union to the left-hand side of the cylinder head.

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.

**Oil Flow (Grand Prix models only)**
On Grand Prix machines, the oil is circulated through the frame members via oil pipes to provide greater engine cooling (see Fig. A.3). The oil flow can be examined if the oil filler cap and baffle unit are removed whilst the engine is running, when the returning oil should be seen issuing from the return pipe. The oil will in all probability contain air bubbles, but this is a normal condition due to the larger capacity of the return pump.

If there is no oil flow from the return pipe, stop the engine immediately and investigate the cause.

Provided the transparent oil pipes are clean, the oil should also be seen circulating round the system and any drop in oil level can be detected immediately.

The pipes are made of a plastic and are attached to the frame spigots with special clips. It is most important that these connections are in good order, and if there is any doubt about the efficiency of a joint it should be re-made.

Examine the connections regularly to ensure that this condition is maintained.

**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 kilometre) intervals during the running-in period and thereafter as stated on page A.2.

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

**Victor Enduro and Special (U.S.A.) models**
The oil tank filter is screwed into the lower right-hand corner of the tank (see Fig. A.4). Obtain a suitable receptacle with a piece of stiff material 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.

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

Again using a suitable receptacle to catch the oil, unscrew the four nuts holding the sump filter to the crankcase, take off the shakeproof washers and remove the filter. Also disconnect the supply and scavenge pipes at the crankcase union (one nut).

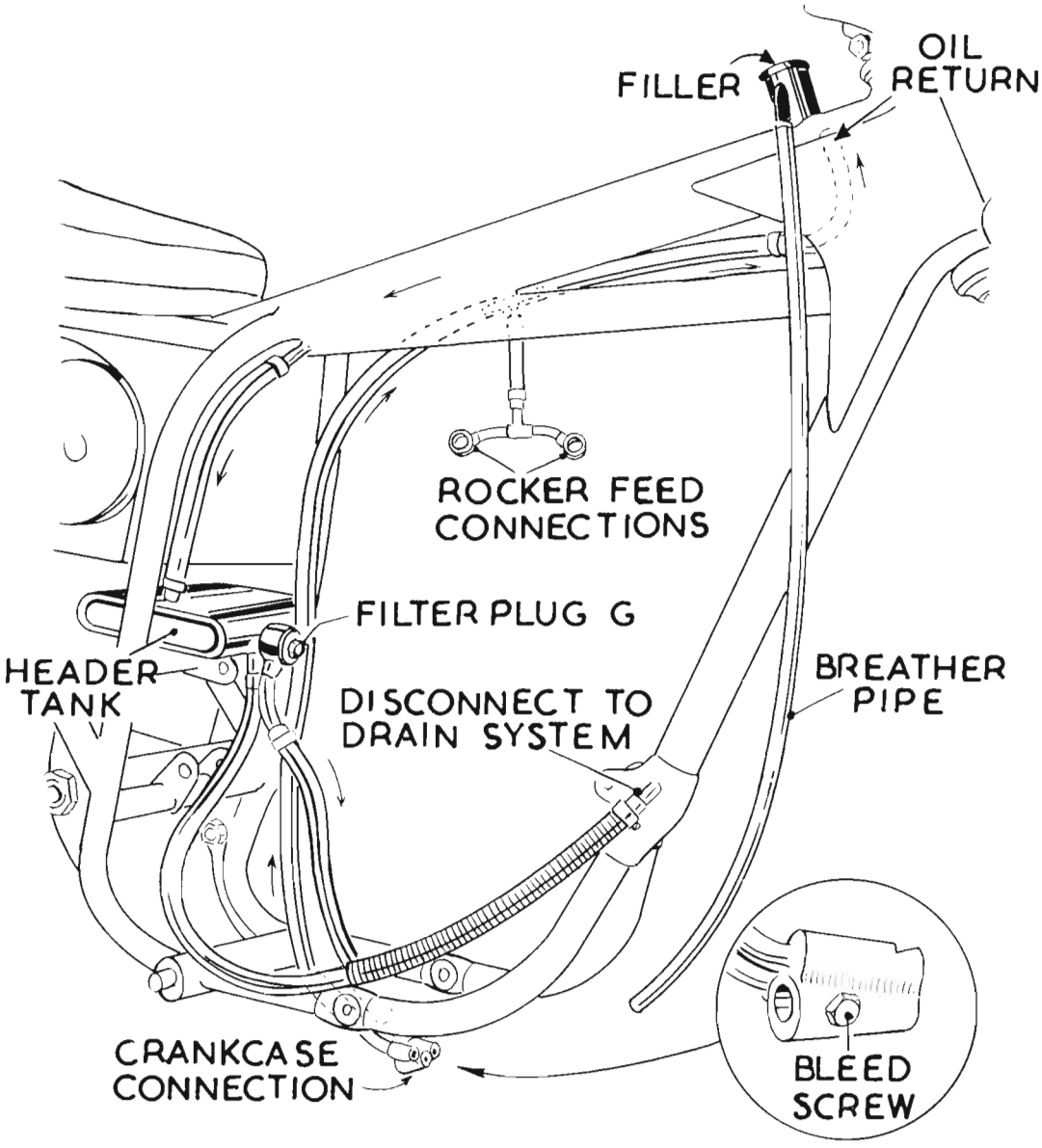


FIG. A.3. *The lubrication system (Grand Prix models).*

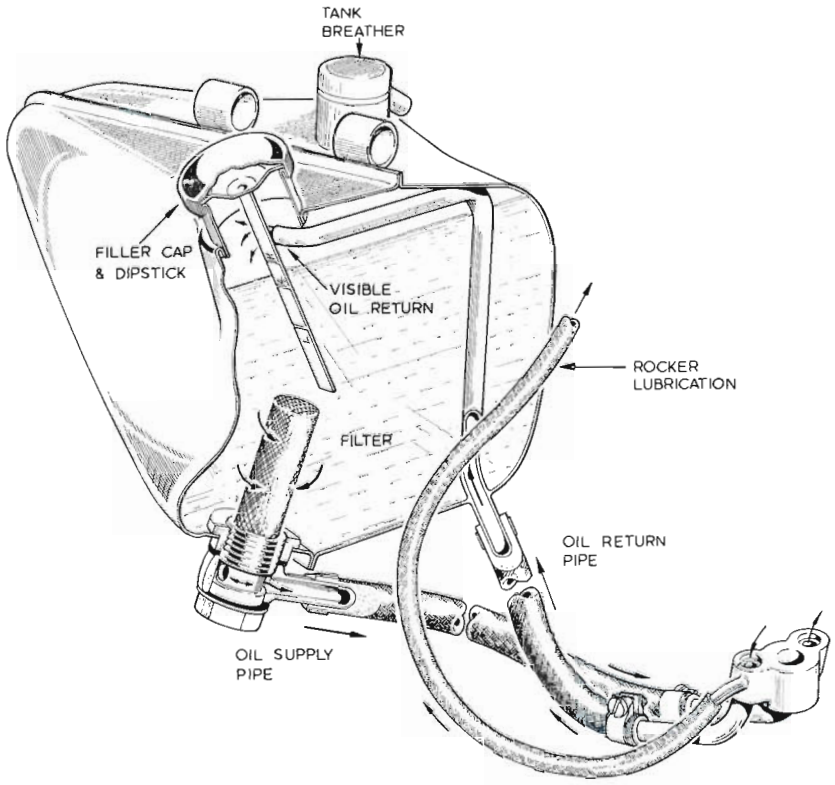


FIG. A.4. *Oil tank and filter (Victor Special* 1968).

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 re-assembly.

**Victor Grand Prix models**

The oil pipe connection at the base of the frame front down tube is fitted with a screw-type clip. When this is released, the flexible pipe can be withdrawn from its frame union and the oil will flow from both portions of the connection (see Fig. A.3).

Disconnect the supply and scavenge pipes at their union with the crankcase (secured with one nut) and take off sump filter. After draining oil, remove and clean the filters in the header tank (see Fig. A.6) and sump. Replace the pipe lines, re-make the joints carefully and prepare to re-fill the system with one of the oils recommended on page A.3.

Remove the baffle unit in the filler orifice and refill with oil to the correct level (i.e. until the oil level is visible at the bottom of the filler neck).

In order to avoid any possibility of an air-lock in the system when refilling with oil, remove the bleed screw from the crankcase oil pipe union and replace only when oil begins to issue from the hole. The machine should then be ridden for about 10 minutes to circulate the oil. Replenish if necessary, to fill the system completely.

After draining and refilling the lubricating system, 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. Be sure to replace the baffle unit.

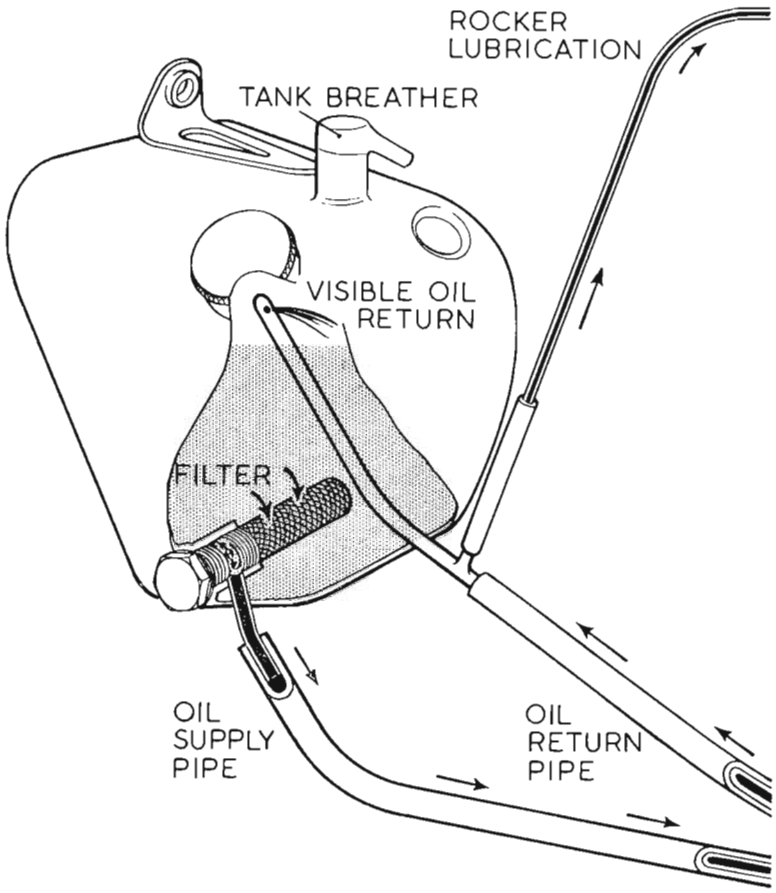


FIG. A.5. *Oil tank and filter (Victor Enduro and Special (U.S.A.).*

**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.

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 on page A.10.

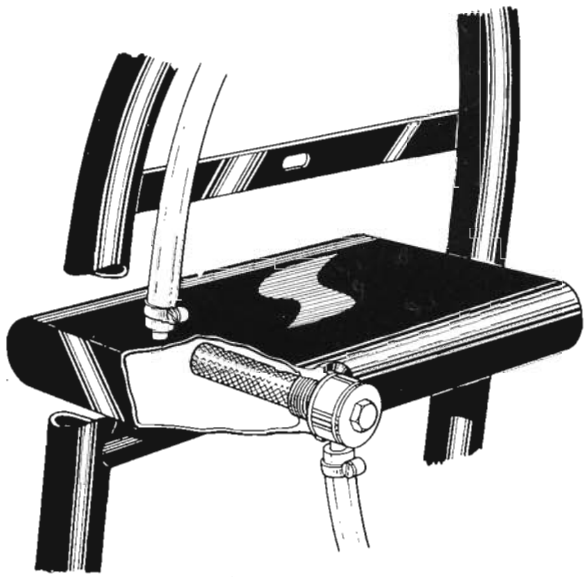

FIG. A.6. *Header tank (Victor Grand Prix).*

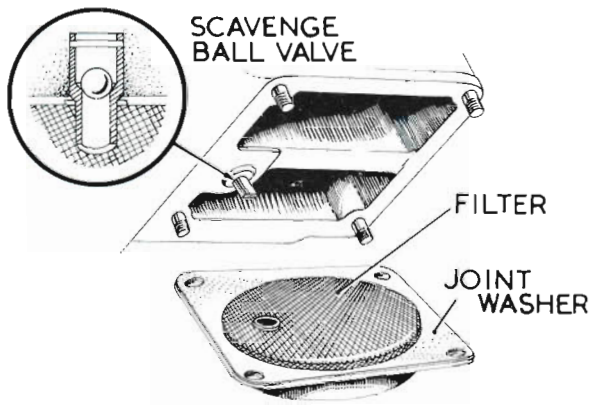


FIG. A.7.

**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.

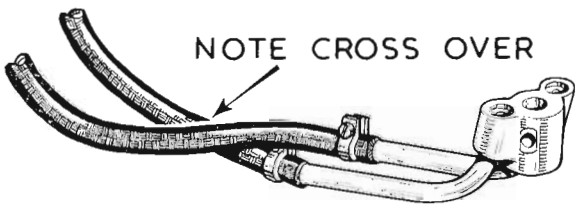


FIG. A.8.

## OIL PRESSURE AND NON-RETURN VALVES

A constant oil pressure is maintained by the release valve situated on the front right-hand side of the crankcase (see Fig. A.9).

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.

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

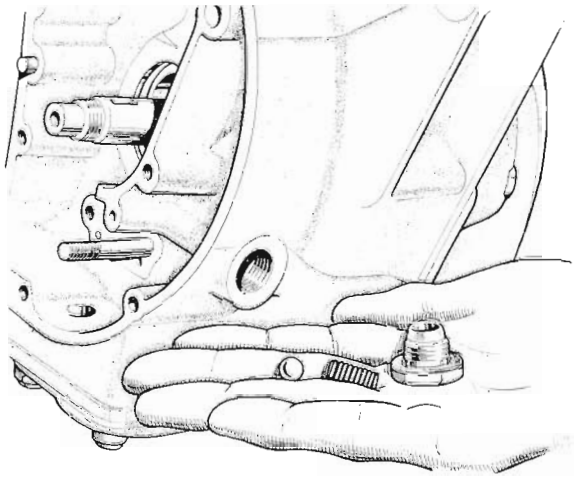

FIG. A.9.

**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 (Enduro and Special (U.S.A.) models) or in the frame members (Grand Prix model). 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.

**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.

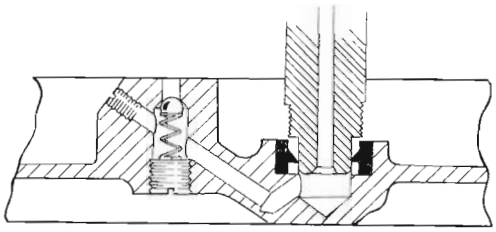

FIG. A.10. *Non-return valve.*

The feed line non-return valve consists of a ball and spring and is located in the inner timing cover (see Fig. A.10). 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 A.8.

## 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 rebuilding. Note also the position of thrust washers below top gears.

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.

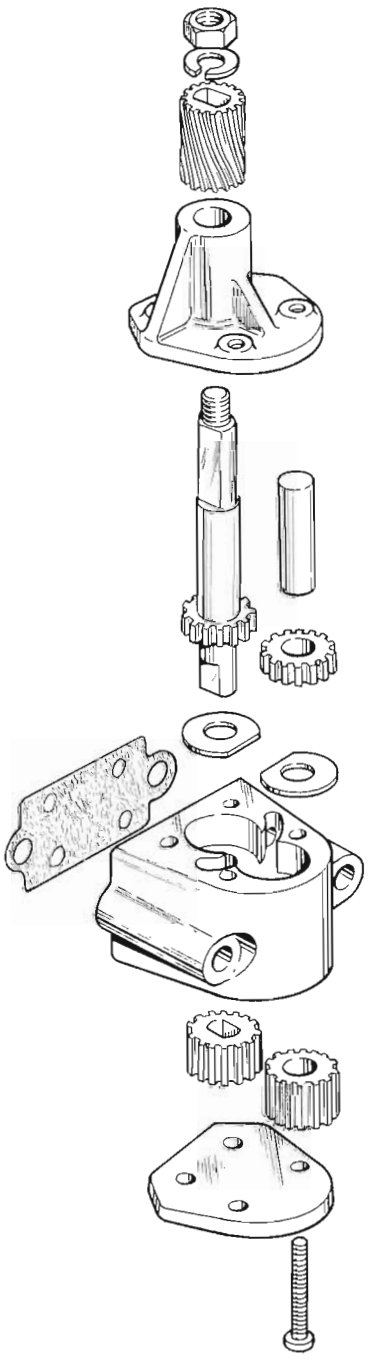

FIG. A.11. *Oil pump exploded.*

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

**Rebuilding the Pump**

Absolute cleanliness is essential when rebuilding the oil pump.

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

Fit the driven spindle and gear into the cover and replace thrust washers. 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 with four screws.

Finally, check the joint faces for parallelity; if the housing face is not level, it will be distorted when bolted to the crankcase and may prevent the pump from working.

## 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.

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

The contact breaker cam is lubricated from an oil-soaked felt wick which should have a few drops of engine oil (S.A.E. 20 or 30) applied every 5,000 miles (8,000 kilometres)—see Fig. A.12.

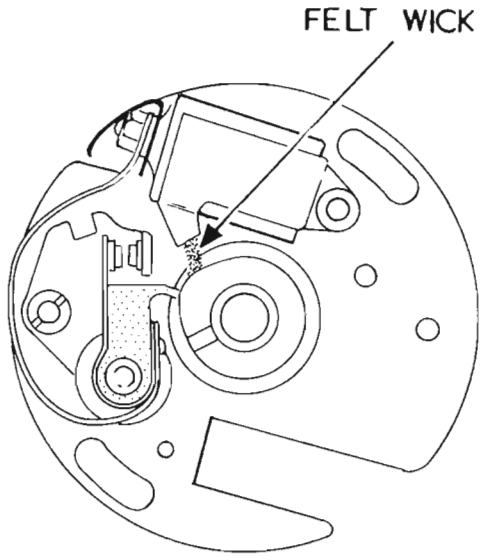


FIG. A.12. *Contact breaker.*

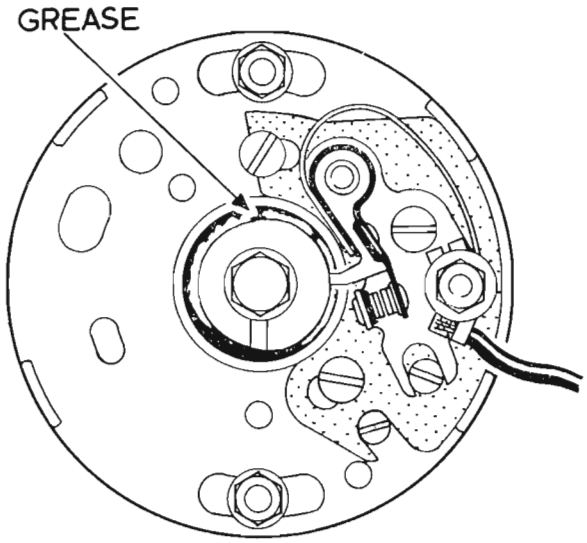


FIG. A13. *Contact breaker* 1968.

On 1968 models a new type of contact breaker is fitted, this has no felt wick so it must be lubricated as follows: apply a small amount of grease to the cam (Shell Retinax A or equivalent) so that the heel picks the grease up when the cam is in motion. Not too much grease should be applied as grease must not come into contact with the contact points. It will be necessary to re-lubricate the cam every 6,000 miles (9,600 kilometres)—see Fig. A.13. Later 1968 models were fitted with a felt wick and should be lubricated as pre-1968 models.

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

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

After lubricating, replace the plate to the marks, but if the timing has been upset, follow the instructions on pages B.35–36.

### GEARBOX LUBRICATION

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

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 filler plug on top of the gearbox then unscrew and take out the larger of the two plugs underneath, draining the oil into a suitable receptacle (see Fig. A.14).

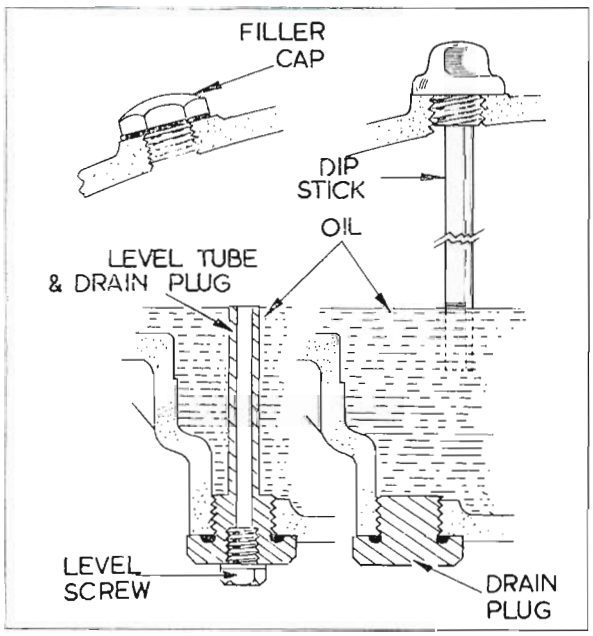


FIG. A.14.

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

Now fill the gearbox with fresh oil until it begins to overflow down the drain plug tube, then replace the small plug.

1968 Victor Specials have a nylon filler cap and dipstick, this cancels out the need for a level plug but the large drain plug has been retained. To drain the gearbox take out the dipstick and drain plug, draining the oil into a suitable receptacle.

To fill replace drain plug first checking that the rubber "O" ring is still intact, this should be replaced if not, then pour in the required amount of clean oil and check level with dipstick.

Recommended grades of oil are quoted on page A.3, capacities on page GD.8 and checking frequency on page A.2.

### PRIMARY DRIVE

Like the gearbox, the primary chaincase, having its own oilbath, is independant of the engine but the level of oil must be checked periodically and the oil drained and replaced as indicated in the routine maintainance sheet, page A.2.

The oilbath in the primary chaincase does not lubricate the chain only, the clutch being contained in the same case is dependant on this oil supply for its efficient functioning and, in the case of Victor Enduro and Special (U.S.A.) models, 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 front one being the oil level screw and the rear is the drain screw (see Fig. A.15).

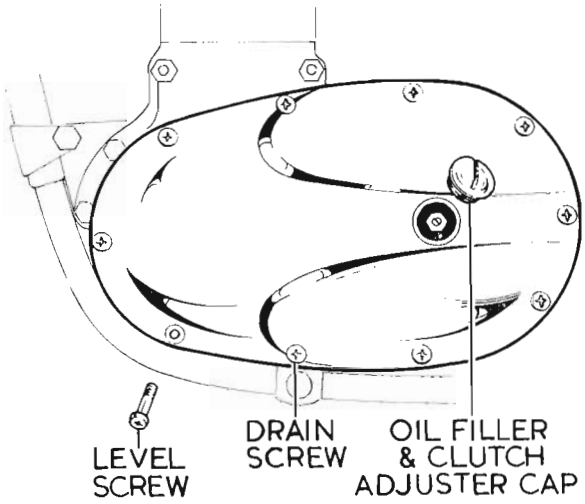


FIG. A.15.

To drain the oil, take out the inspection cap at the side of the case and the drain screw.

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.

To drain and refill the primary chaincase on the 1968 Victor Special, proceed as follows: to drain, take out the drain screw and the inspection cap at the top of the chaincase.

The other small cap is only removed to enable clutch adjustment to be carried out, and the large inspection cover held by four screws is for timing purposes.

To refill the chaincase replace the drain screw and take out the level screw, pour oil through the inspection cap aperture until it is seen to be running out of the level screw hole. Then replace level screw and inspection cap, see Fig. A.15.

Oil containing molybdenum disulphide or graphite must NOT be used in the primary chaincase

When replenishing, use only the grades recommended on page A.3.

## REAR CHAIN

On Enduro and Special (U.S.A.) models only, 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 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.

A chain oiler is not provided on the Grand Prix models, so the chain must therefore be lubricated periodically with an oil can to keep it moist with oil.

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 tallow to which powdered graphite has been added.

Hang the chain over the grease tin to allow the surplus grease to drain off. If the tin is covered after use it can be used many times, but always use care when melting the tallow.

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).

### STEERING HEAD

The steering head bearings are packed with grease on assembly and only require repacking at the intervals quoted on page A.2. Removal and replacement of the steering is dealt with on pages E.3 and E.4 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 on page A.3.

There are several methods for determining the correct number of ball bearings to use, but the most effective method is to fill the cup completely with ball bearings and then extract one. The correct number of ball bearings for each cup is twenty.

### FRONT 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.

Oil leakage midway up the forks usually indicates that an oil seal has failed and requires replacement; this is dealt with on page E.5 covering the dismantling and reassembly of the forks.

Correct period for changing the oil as quoted on page A.2 is every 10,000 miles (16,000 kilometres) 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 slowly 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 ⅓-pint of oil into each fork leg (see page A.3 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.

### WHEEL BEARINGS

The wheel bearings are packed with grease on assembly and only require repacking at the intervals given on page A.2.

The bearings should be removed as quoted on pages F.4, F.8 and F.9. 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 on page A.3 after assembling the first bearing.

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

### CONTROL CABLES

Exposed sections of inner cables should be lubricated periodically (see page A.2). This can be done either by greasing or applying the oil can.

The most satisfactory way, however, is to induce a flow of oil between the inner cable and casing by using a simple oil reservoir as shown in Fig. A.16 and leaving the cable for several hours.


FIG. A.16.

During their manufacture, the inner cables are greased with a molybdenum based grease which forms a semi-permanent lubricant and should therefore give long service before needing attention.

## SPEEDOMETER CABLE
**(Victor Enduro and Special (U.S.A.) models only)**

It is necessary to lubricate 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.

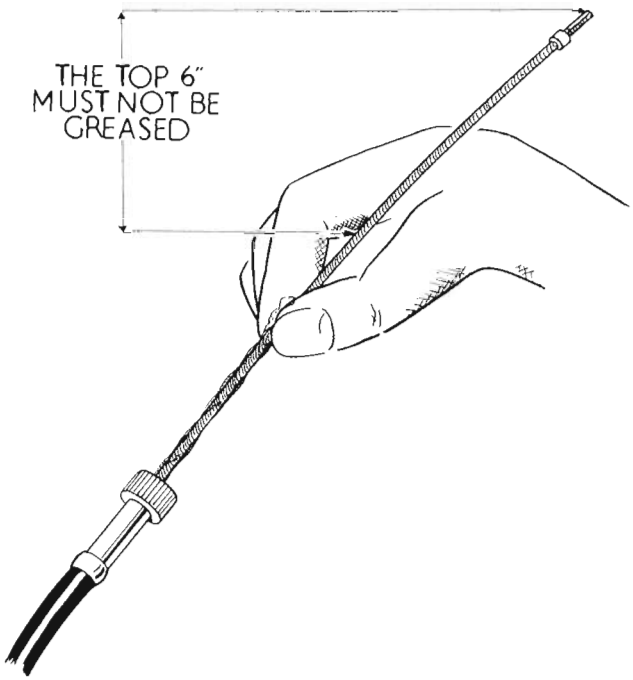


FIG. A.17.

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## INDEX

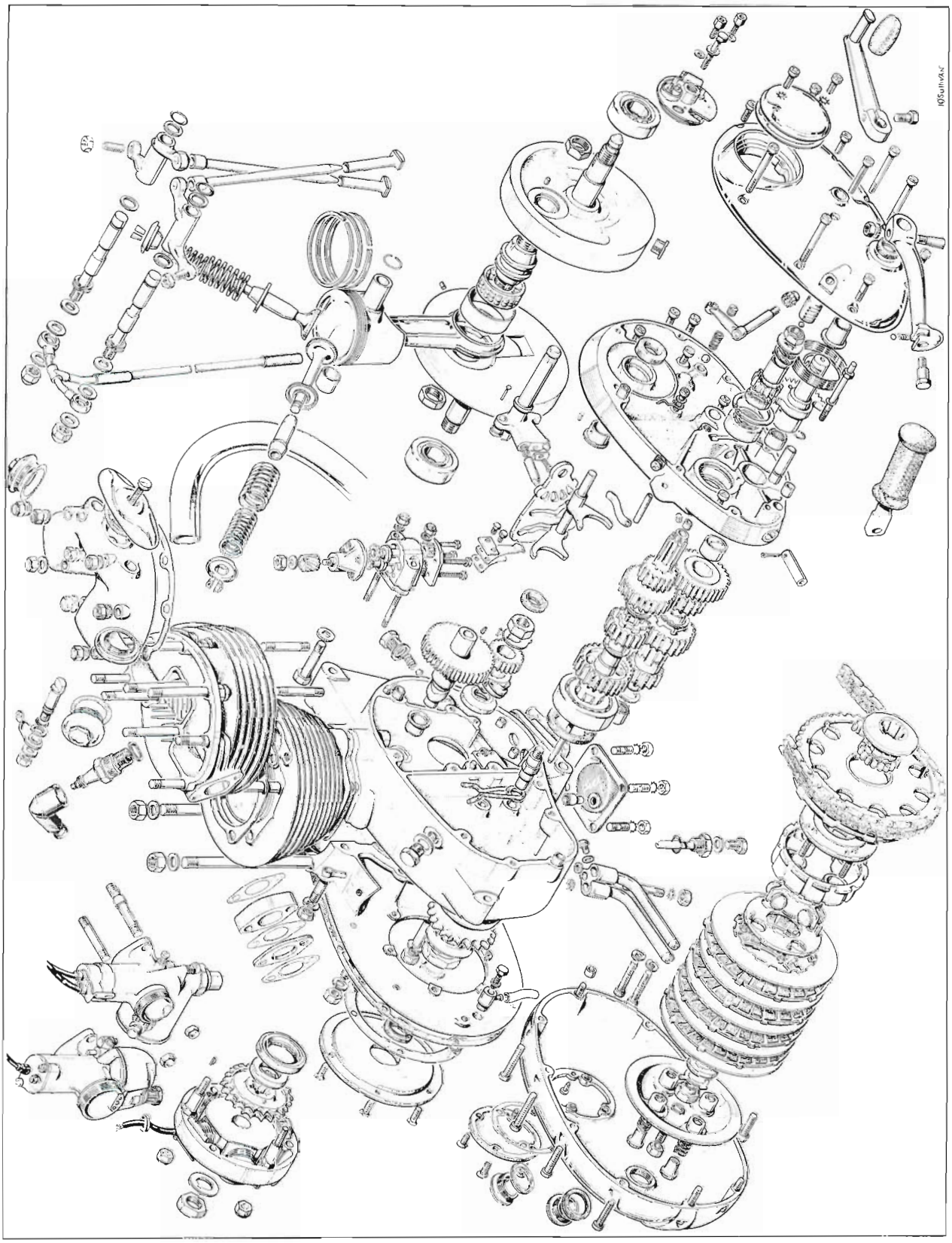


FIG. B.1. *Engine exploded* (*pre*-1967).

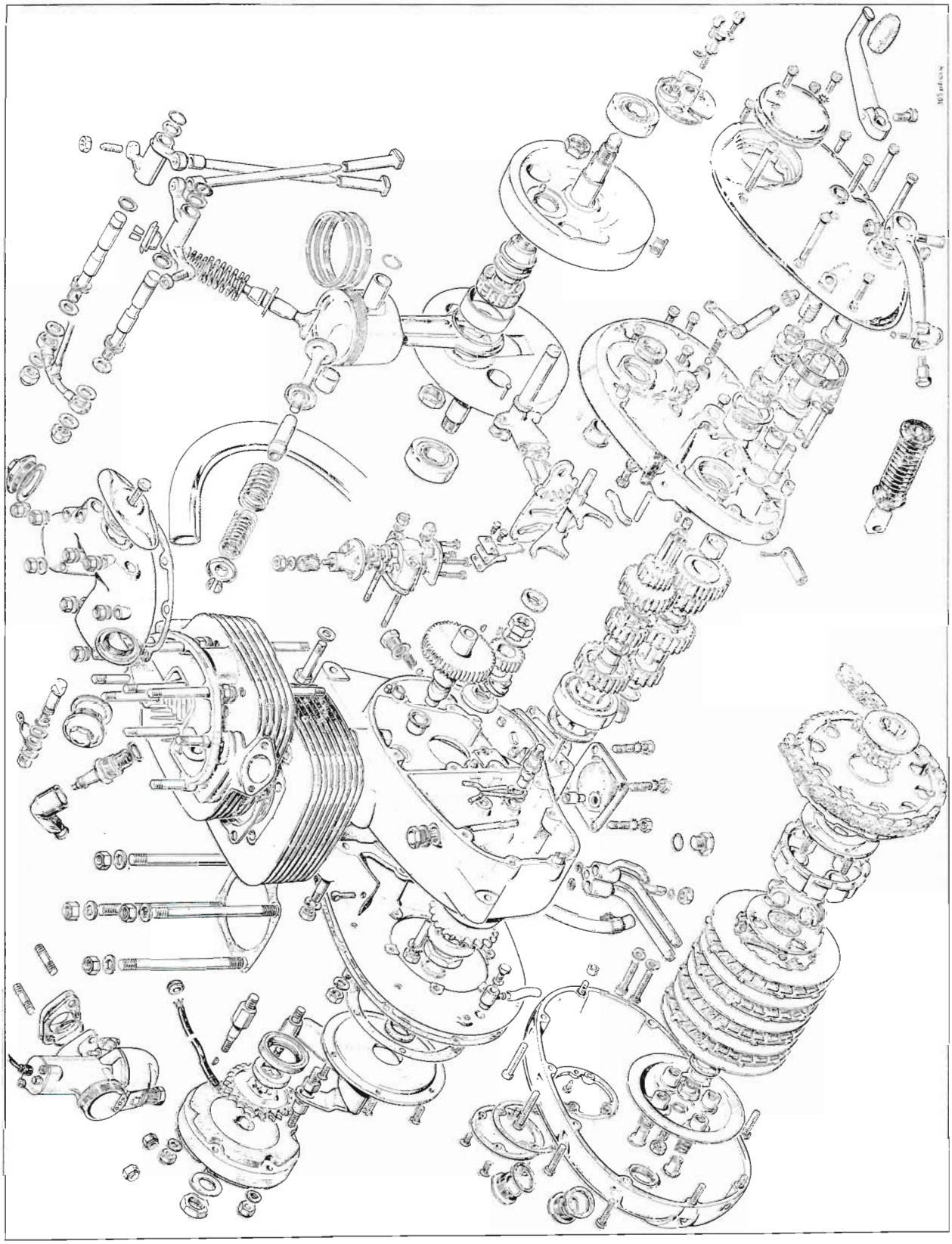


FIG. B.1A. *Engine exploded* (1967 *onwards*).

## DESCRIPTION

The o.h.v. four-stroke engine is of the unit construction type and has a single cylinder barrel fitted with an austenitic iron liner. Victor Grand Prix engines, however, have a chromium-plated "Y" alloy barrel.

A special "Lo-Ex" aluminium piston having two tapered compression rings and one scraper ring is used on a H-section connecting rod, employing a roller bearing big-end assembly. It should be noted that on Victor Enduro and Special (U.S.A.) engine only, where an austenitic iron liner is fitted, the piston rings are chromium-plated. These rings must not, of course, be used in the chromium-plated bore of the Victor Grand Prix engine. Chrome rings on the Victor Special have now been cancelled for 1968.

Two balanced flywheels (with crankshafts) and the crankpin are held together by two large nuts, the unit revolving on two crankcase bearings.

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.

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 a six-coil stator, mounted on three shouldered studs and a rotor, secured to the drive-side shaft.

A vertically mounted oil pump of the double gear type is driven off a worm wheel on the gear-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 oilbath.

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

## 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 too heavy and therefore likely to cause pre-ignition or other symptoms which may impair the engine 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 $\frac{3}{16}$ 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 No. 65–9240, and course/fine grade grinding paste
Valve Spring Compressor No. 61–3340
Clean engine oil
Pieces of hard wood to support piston
Top Overhaul Gasket No. 00–3163
Gudgeon Pin Circlips No. 66–954 (2)
Valve Springs (set) Nos. 65–2494 (outer) and 65–2495 (inner)
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.

**Victor Grand Prix models**
Because the clearance between the cylinder head and frame top tube is not sufficient to allow the head to be lifted off, it will be necessary to take the engine out of the frame (see page B.12).

An alternative to this is to extract all the rocker box studs, allowing the rocker box to be removed from one side, so providing the necessary clearance for removal of the cylinder head.

Continual extraction of the studs will eventually impair the threads in the head and it is preferable therefore, to remove the complete engine.

The Victor Grand Prix machine, however, is built specially for use in Scrambles events and hence it will almost never be necessary to dismantle the engine solely for a simple decarbonising job, as is usual with a machine for road use.

**Victor Enduro and Special (U.S.A.) models**
To facilitate removal of the cylinder head, first take off the petrol tank (see page B.13).

With the tank removed, the engine steady bracket can be disconnected, together with the exhaust valve lifter cable.

The exhaust pipe is a push-fit into the cylinder head and can be withdrawn after releasing the nuts holding the exhaust system to the frame.

Disconnect the rubber adaptor between the air cleaner and carburetter, so that the latter can be withdrawn from its studs and tied back out of the way. On 1968 models the air cleaner is screwed on to the back of the carburetter therefore they can be removed together.

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

**Removing the Cylinder Head**
Set the piston at top dead centre on the compression stroke (both valves closed) and take off the 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. On Victor Enduro and Special (U.S.A.) models, when the engine is in the frame, it will 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.

If it is necessary to dismantle the rockers and spindles, take care to renew any damaged rubber sealing rings. Refer to Fig. B.2 for details of correct reassembly.

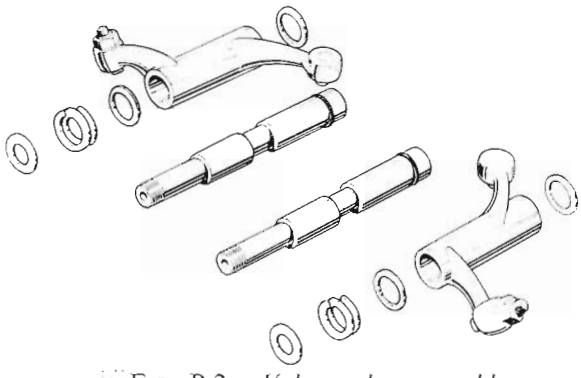


FIG. B.2. *Valve rocker assembly.*

**Removing the Valve Springs**
Using Service Tool No. 61–3340 or similar 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 placed on a numbered board to indicate their position in the cylinder head.

The springs may have settled through long use and they should therefore be checked in accordance with the dimensions quoted on page GD.3.

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.

An old valve guide can be driven out with Service Tool No. 61-3382 but, the aluminium head should first be heated by immersing in ho water. 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.

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.

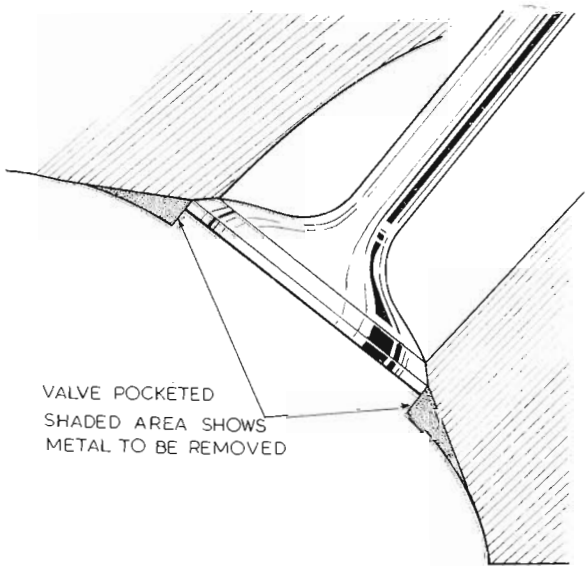



FIG. B.3. *Pocketed valve.*

**Valve Grinding**

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

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

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

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 Service Tool No. 65–9240, 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 surfaces of both the valve and seat show a uniform matt finish all round.

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

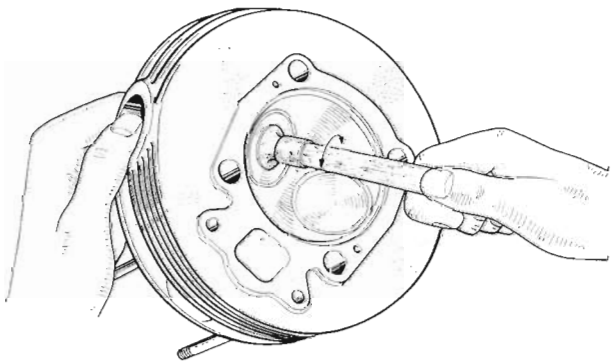


FIG. B.4. *Grinding-in valve.*

**Re-assembling 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 compress the springs with Service Tool No. 61–3340 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.

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

If the bore is worn it 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.

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.

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

After cleaning the piston crown, rotate the engine to lower the piston and wipe away 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.

**Removing Cylinder Barrel**

To remove the cylinder barrel, rotate the engine until the piston is at the bottom of its travel, then lift the barrel upwards until the piston emerges from the base of the bore. Steady the piston as it comes free from the cylinder so that it is not damaged by 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.

On Victor Grand Prix models, the cylinder bore is chromium-plated and should not therefore be subject to a great deal of wear.

If, however, wear of this nature is apparent, the complete cylinder barrel must be replaced.

The cylinder barrel used on the Victor Enduro and Special (U.S.A.) models is fitted with an austenitic iron liner, enabling a .010 in. and .020 in. rebore to be carried out for use with oversize pistons.

**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.

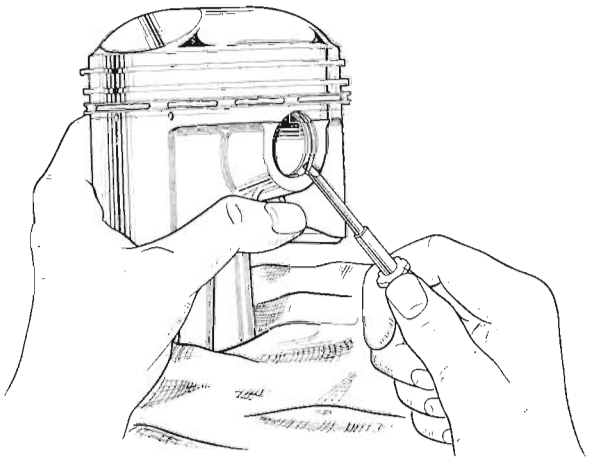


FIG. B.5. *Removing circlip.*

Before the gudgeon pin can be withdrawn the piston must be thoroughly warmed by wrapping it in a rag that has been soaked in hot water and wrung out. Alternatively an electric iron can be applied to the piston crown until enough heat is obtained.

When the piston is warm, tap out the gudgeon pin with a suitable drift, supporting the piston to avoid any side strain on the connecting rod.

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.

**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 ends of each ring lie at least $\frac{3}{16}$ in. apart.

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

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

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

Measure the gap between the ends of the ring with a feeler gauge. The correct gap when new is between .009—.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 .009 in. the ends of the ring must be carefully filed to the correct limit.

Both compression rings have tapered thrust faces and one of the horizontal faces is marked "top", to ensure correct assembly. If the rings are fitted upside down, oil consumption will become excessive.

NOTE:—Chromium-plated piston rings must not be fitted to Victor Grand Prix models.

**Small-end Bush**

Small-end bush wear is normally very slight, but when excessive it can cause an unpleasant high pitched tapping sound.

The gudgeon pin should be a good sliding fit in the bush but if there is considerable up and down movement, then the bush should be replaced.

The bush can be changed in one operation by pushing the old bush out and, at the same time, pressing the new one in with Service Tool No. 61–3653. The new bush must be correctly aligned with the oil hole and reamed to .7503—.7506 in. after pressing into the connecting rod.

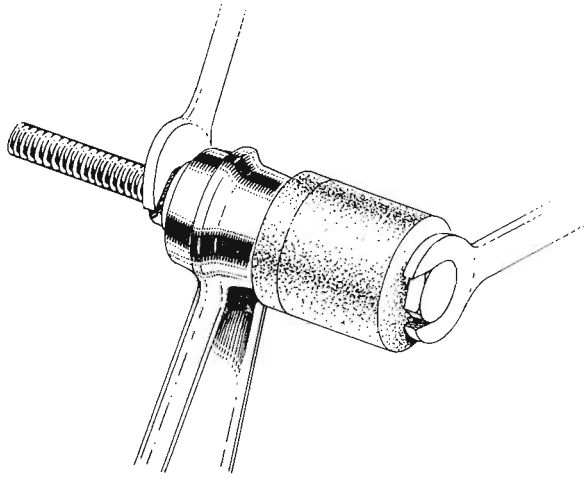


FIG. B.6. *Using Service Tool No.* 61–3653.

**Reassembly after Decarbonising**

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 that 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. 61-3707, 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.

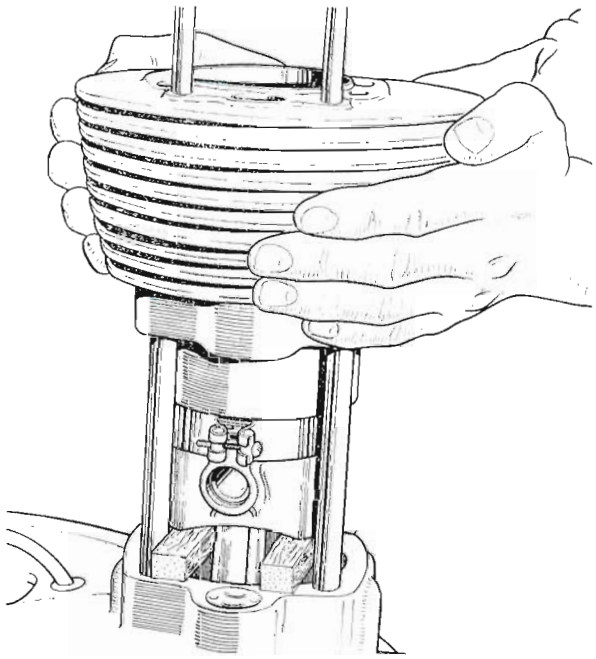


FIG. B.7. *Replacing cylinder barrel.*

Insert the two push rods down the barrel aperture, on to their respective tappets, the outer one operating the inlet push rod (see Fig. B.8).

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.

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. Alternatively, the valve rocker adjusters should be completely slackened off.

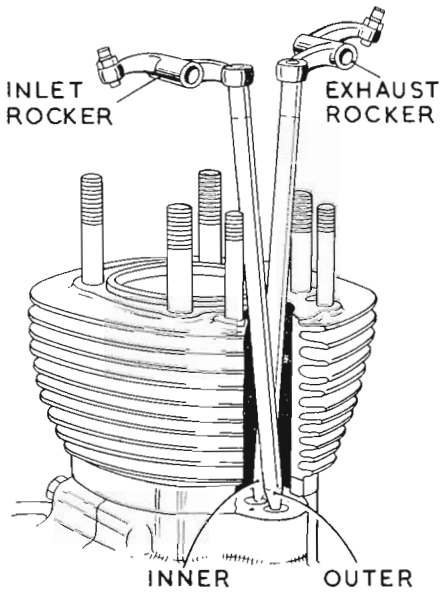



FIG. B.8.

Now, using a suitable torque wrench, tighten the six cylinder head fixing nuts firmly and evenly to the figures quoted on page H.1. Check that the push rods are correctly located in their proper positions and tighten the rocker box fixing nuts. Replace the inspection cover with its sealing washer

Finally, check the valve clearances as described on page B.12 and replace the sparking plug.

If decarbonising has been carried out with the engine in the frame, proceed as follows:—

Replace the carburetter washers and thermal block over the studs. Refit the carburetter and tighten the fixing nuts to a torque wrench setting quoted on page H.1.

Secure the air cleaner adaptor in position with clips and reconnect the rocker oil feed pipes (not necessary on 1968 models).

Replace the exhaust system and engine steady bracket, complete with exhaust valve lifter cable.

Finally, refit the petrol tank as described on page B.13.

If, as in the case of the Victor Grand Prix model, the engine was removed for decarbonising, see pages B.13 and B.14 for details of replacement.

**Checking Valve Clearances**

The clearances between the top of each valve stem and the rocker adjusting pin, must be set when the engine is quite cold.

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

Set the piston at top dead centre on the compression stroke (both valves closed) and using a feeler gauge, check that the fully open gaps for the inlet and exhaust valves are as follows:—

ENDURO AND SPECIAL (U.S.A.):
.008 in. (inlet) and .010 in. (exhaust)

GRAND PRIX: .015 in. (both valves)

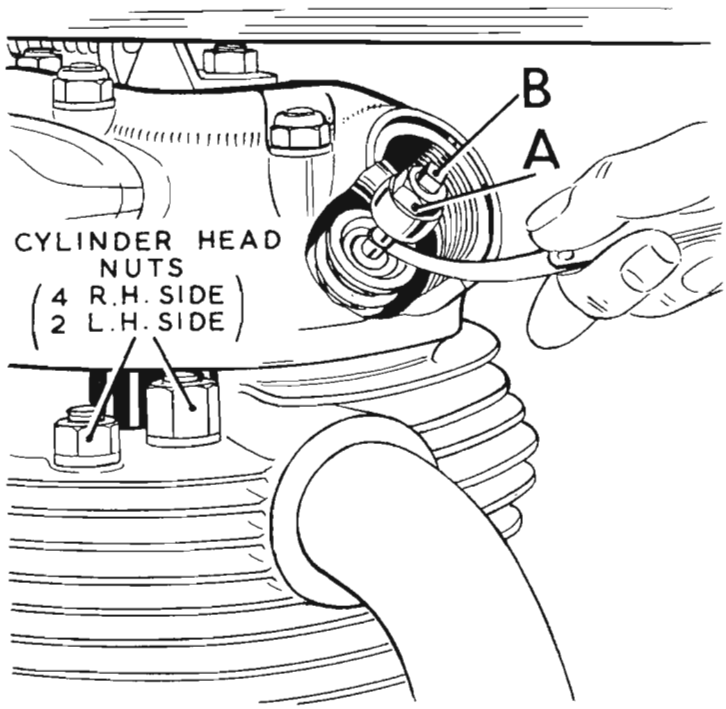



FIG. B.9 *Checking valve clearances.*

If the clearance requires adjusting slacken the locknut (A) and adjust the pin (B) until the correct gauge will just slide between the valve stem and pin (see Fig. B.9).

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

Check the clearance again to make sure that the setting has not altered whilst tightening the locknut.

## 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 tap and disconnect the pipe. 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. On Victor Grand Prix models, only, the tie-bar fitted to the front underside of the tank, must also be removed before the tank can be lifted away.

(b) Release the exhaust pipe from the front engine mounting and loosen the clip at the silencer (Victor Enduro and Special (U.S.A.), or at the expansion box (Victor Grand Prix). The exhaust pipe is a push-fit into the cylinder head port and can now be withdrawn from the front.

(c) Remove the crankcase shield and drain the oil system as detailed on page A.7. On Victor Enduro and Special (U.S.A.) models it will also be necessary to drain the oil tank

Uncouple the rocker oil feed pipes and the supply and scavenge pipes union beneath the crankcase.

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

(e) Release the flexible connection between the carburetter and the air cleaner by loosening the retaining clips. After removing the flange fixing nuts, the carburetter can be withdrawn from its studs and tied up out of the way. On 1968 models the air cleaner can be taken off with the carburetter.

(f) Remove the engine steady tie bar and bracket, complete with exhaust valve lifter cable.

(g) On Victor Enduro and Special (U.S.A.) models, it will now be necessary to remove the chainguard (see page D.6).

(h) Finally uncouple the rear chain at its spring link, detach it from the gearbox sprocket and disconnect the clutch cable.

The engine/gearbox unit is mounted in the frame at three points. At the rear the attachment is by two triangular plates which must first be removed (three large bolts). On Victor Enduro and Special (U.S.A.) models, these plates are welded to the frame down tube, the engine being held by two bolts. 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. Whilst withdrawing the final fixing bolt, great care should be taken to avoid trapping the hand or fingers, as the engine may shift its position suddenly.

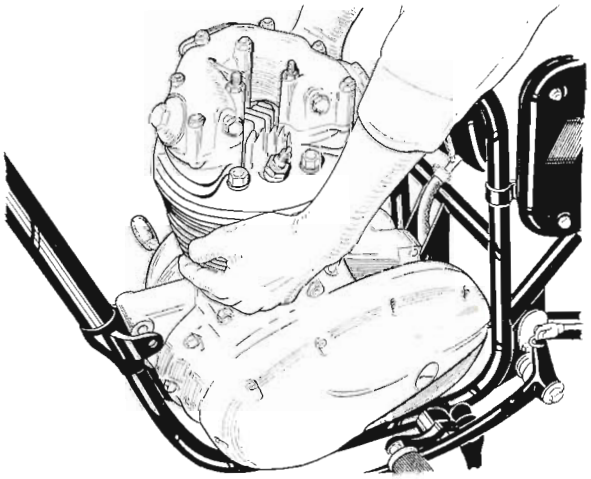


FIG. B.10. *Removing the engine.*

Raise the engine at the front until it is clear of the frame lug, then tilt it backwards.

On Victor Enduro and Special (U.S.A.) models, it will be necessary at this stage to disengage the engine lug from the rear frame brackets.

The engine unit can now be lifted out from the left-hand side of the frame.

Replacement of the engine unit is a reversal of the above procedure for removal, but a check must be made to ensure that all nuts and bolts are tightened securely and that the handlebar controls are suitably re-adjusted.

## TRANSMISSION

### Description

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

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

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

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

Thus it will be evident that the satisfactory operation of one part of the transmission system is dependent on another 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.

### Removing Primary Drive 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.

On Victor Enduro and Special (U.S.A.) models, the rearmost cover screw also secures the rear chain oiler but on Victor Grand Prix models, where a chain oiler is not used, the screw is fitted with a nut and washer.

Drain the oil as described on page A.13 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.

### Clutch Dismantling

Remove the locking wires and the four spring retaining nuts 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 Service Tool No. 61–3774, 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 held 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.

### 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 back of the chaincase. Take care not to damage the windings of the coils when pulling the stator off its studs. Note that the stator unit is fitted with the lead on the outside.

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.

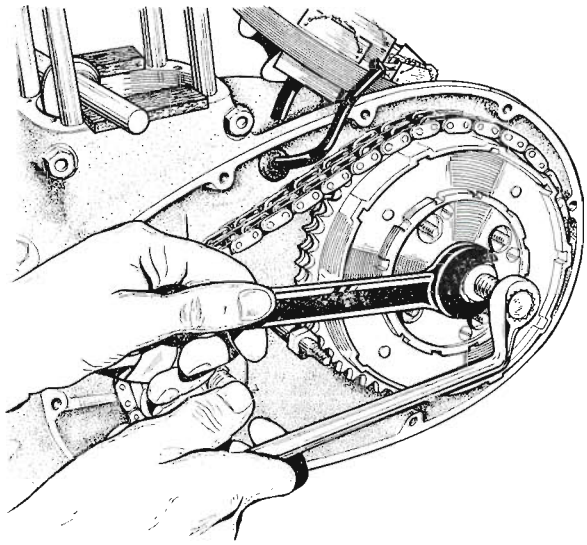


FIG. B.11. *Removing clutch.*

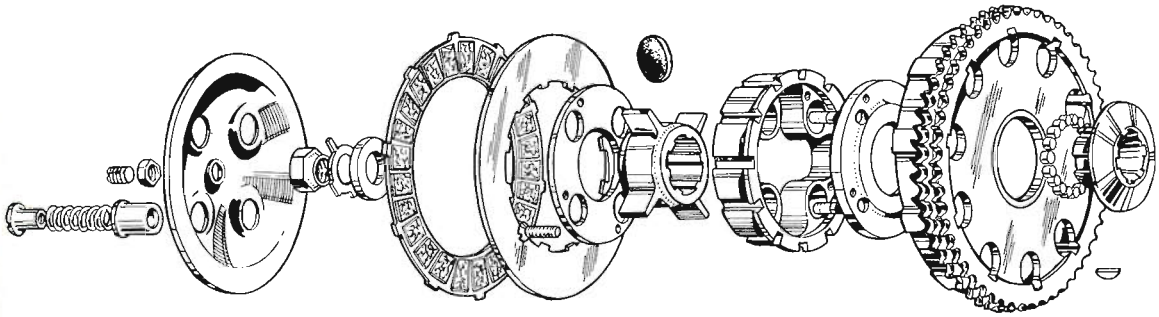


FIG B.12. *Clutch exploded.*

With extractor No. 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.

**Inspecting the Clutch**

The four driving plates have segments of special friction material which are securely bonded in the metal. These segments should all be complete, unbroken and not displaced. Even if there is no apparent wear or damage to the plates or segments, the overall thickness of each segment should be measured and if the extent of wear is more than .030 in. (.75 mm.), the plates should be replaced. Standard thickness is .167 in. (4.242 mm.).

The tags on the outer edge of the plates should be a reasonable fit in the chainwheel slots and should not be "hammered" up. 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.

**Cush Drive**
To inspect the cush drive 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 clutch rubbers it may be found necessary to use a lubricant, in which case a liquid soap is recommended.

Do not use oil or grease.

**Clutch Chainwheel**
Examine the 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.

**Gearbox or Final Drive Sprocket**
Access to the gearbox sprocket can only be obtained when the clutch 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.

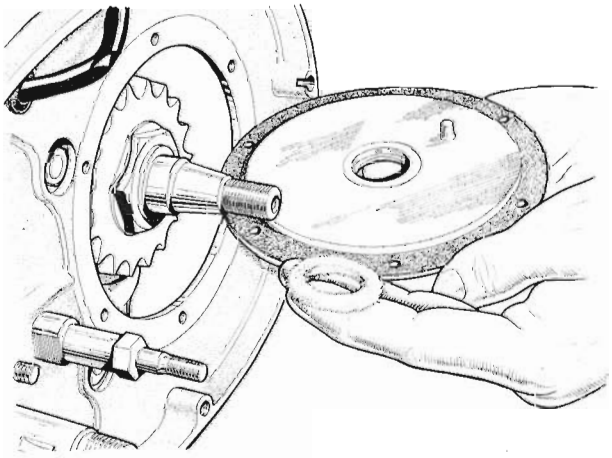


FIG. B.13. *Primary case back plate.*

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.

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.

**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 below for details of clutch adjustments.

**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 leads through the back of the primary chaincase. This operation may be found difficult if left to a later stage.

The generator leads on the 1968 models pass through a rubber grommet at the front of the chaincase and are retained by a clip at the rear of the case.

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.

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

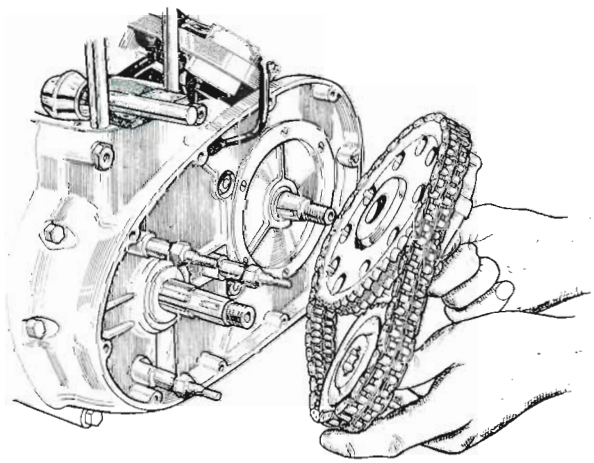


FIG. B.14. *Fitting primary drive.*

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, pass the stator unit through the chain 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 to torque setting on page H.1, lock in position with the tab washer.

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

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

Screw on the four spring nuts with the special screwdriver No. 61–3700 until the underside of each head is approximately ⅛ in. from the face of each 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 running "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. Tighten to torque setting on page H.1.

Turn the tab over the nut after tightening.

Fit the stator on to its studs with the cables on the outside, at the top, and secure with the self-locking nuts. It is important that the air gap between the rotor and the stator pole pieces is equal all round. The gap can be checked with a .008 in. feeler gauge and any variation should be corrected.

Having completed the assembly of the primary drive, the primary cover can now be replaced. Apply jointing cement to both faces of the chain-case 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 (Enduro and Special–U.S.A. models only) is replaced. Victor Grand Prix models do not use a chain oiler, the cover screw being fitted with a nut and washer.

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

## CONTACT BREAKER

**Description**

The contact breaker assembly is contained within a circular compartment in the inner timing cover, its cover being secured by two screws.

The assembly comprises the contact breaker plate, on which are mounted the contacts and condenser (capacitor). 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 in the tapered hole of the camshaft by one central bolt.

The bob-weights, when the engine is stationary, are held closed by the springs, retaining the contact breaker cam in the fully retarded position. This is necessary to make starting easier and considerably reduces "kick-back" on the kickstart lever.

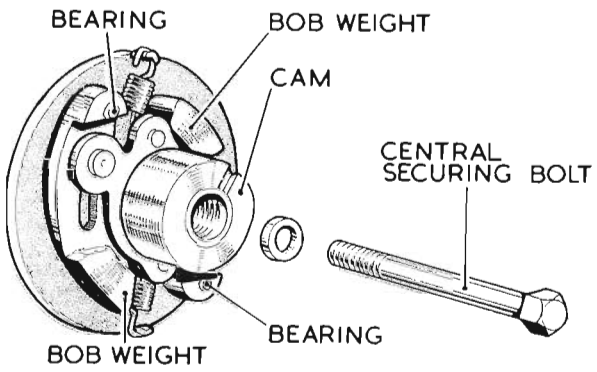



FIG. B.15. *Automatic advance unit.*

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

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

**Removing the Contact Breaker**

Before removing the contact plate, scribe a mark across the plate and housing so that it can be replaced in exactly the same position, otherwise the ignition will have to be retimed.

Disconnect the condenser cable at its snap connector (if not already done), unscrew the two pillar bolts and take off the plate complete with contacts, condenser 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 No. 61–3761 for 4CA type contact breaker or 61–3816 for 6CA and 4CA contact breaker.

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 on page B.32.

**Contact Breaker Points**

To change or inspect the contact points unscrew and remove the barrel nut inside the C-shaped spring and take off the nut securing the spring and lead to the condenser. The movable contact

can now be lifted off, followed by the fibre washer and fixed contact.

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

When replacing, do not omit to fit the fibre washer between the contacts. Also ensure that the insulating strip is fitted on to the condenser terminal before the spring or cable.

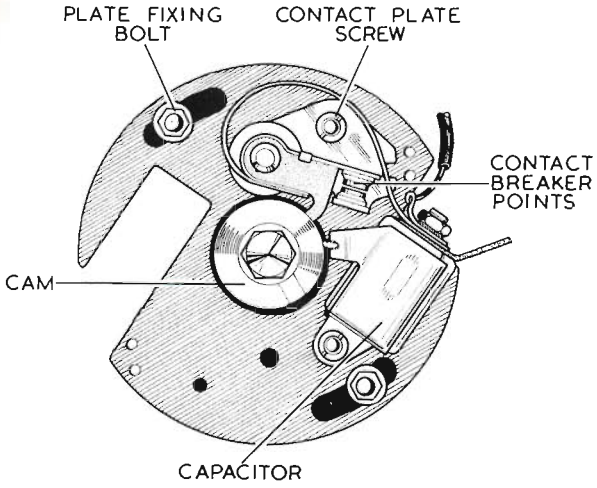



FIG. B.16. *Contact breaker unit.*

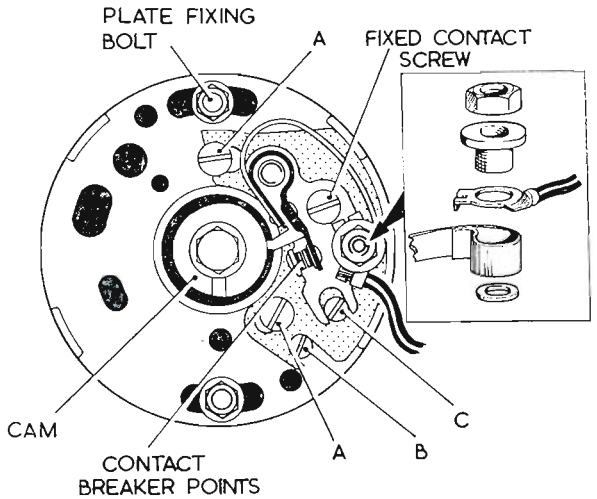



FIG. B.16A. *Contact breaker unit* (1968).

It will now be necessary to reset the contact points gap. Revolve the engine until the fibre heel is on the peak of the cam, loosen the fixed contact screw and move the contact accordingly to give the correct gap of .015 in. (.381 mm.). Tighten the contact screw and re-check the setting.

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 in the operation of the "energy transfer" ignition system.

See pages B.33 to B.36 for full details of ignition timing.

1968 models have a new improved type of contact breaker assembly without a condenser, the latter is now situated in front of the battery held by a single nut and bolt.

Although the elongated slots are still present on the 1968 contact breaker they are not used for fine adjustment any more, as there is a fine adjustment plate added. To adjust the timing, loosen the locking screw (A) and adjust with the eccentric screw (B), larger degrees of adjustment can however, be effected with the elongated holes on the back plate.

Removal, replacement and adjustment of the contact points on the 1968 contact breaker are as follows: to remove the points take out the screw inside the C-shaped spring, and take off the nut securing the spring and lead under the nylon insulating sleeve, the movable contact can now be lifted off, followed by the fibre washer and the fixed contact.

Special note should be taken on exact position of fibre washer and nylon sleeve in relation to C-shaped spring and lead connector.

Replacement is the reverse of dismantling.

It will now be necessary to reset the contact breaker points gap. Revolve the engine until the nylon heel is on the peak of the cam, loosen the fixed contact screw and adjust by turning the eccentric screw (C) until the correct gap of 0.015 in. (.381 mm.) is obtained. Tighten the contact screw and re-check the setting.

## TIMING COVERS

To obtain access to the timing gears or the gear-box components it will be necessary to remove the covers on what is known as the timing or gear-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 gearchange and kickstart pedals, then take out the ten cover retaining screws, noting their respective locations. The cover, complete with contact breaker plate and clutch operating mechanism, can now be withdrawn, exposing the auto-advance unit and kickstart mechanism. Note that the contact breaker lead is held by a spring clip under one of the inner timing cover screws.

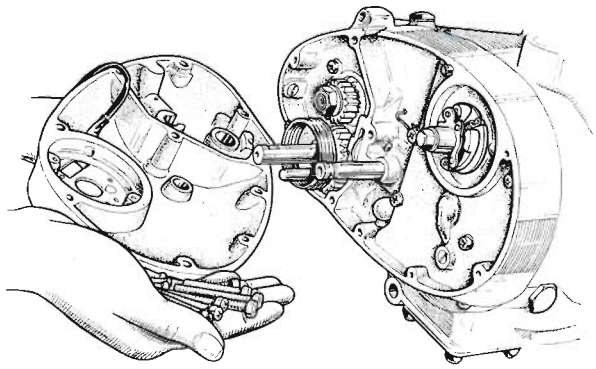


FIG. B.17. *Removing outer timing cover.*

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.

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

To release, free the spring from the kickstart spindle and withdraw the quadrant complete with layshaft needle bearing. The quadrant bush is a push -fit into the outer timing cover.

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 onto its stud.

Remove the contact breaker auto-advance unit as described on page B.18.

Take out the seven fixing screws and note that the contact breaker cable clip fits under the uppermost central fixing screw. 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 only the oil pump and timing gears exposed.

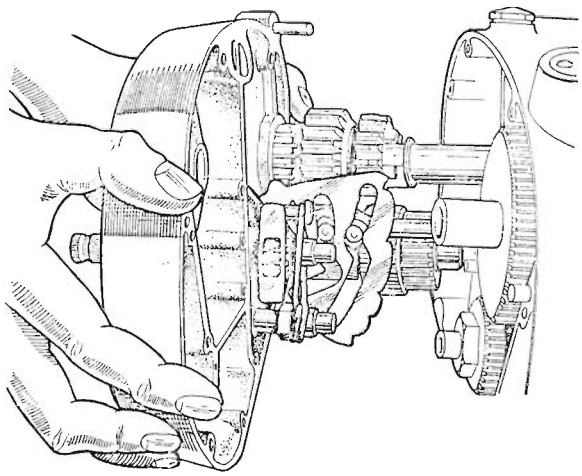


FIG. B.18. *Removing inner timing cover.*

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.

## OIL PUMP, TIMING GEARS AND TAPPETS

**Oil Pump Removal**
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 right-hand thread.

Pull off the crankshaft pinion, using extractor No. 61–3773 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.

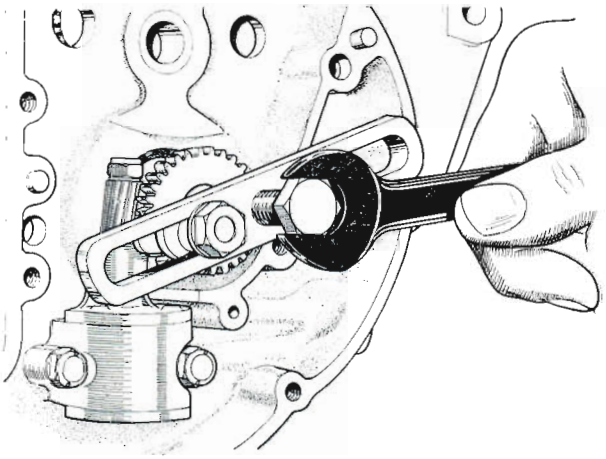


FIG. B.19. *Using tool No.* 61–3773.

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 on pages A.10–A.11.

**Replacing the Oil Pump**
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 quoted on page H.1, to avoid distortion.

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

These marks are to assist in correct reassembly, so ensuring precise valve timing. It is good practice to familiarise oneself with them before removing the gears (see Fig. B.20).

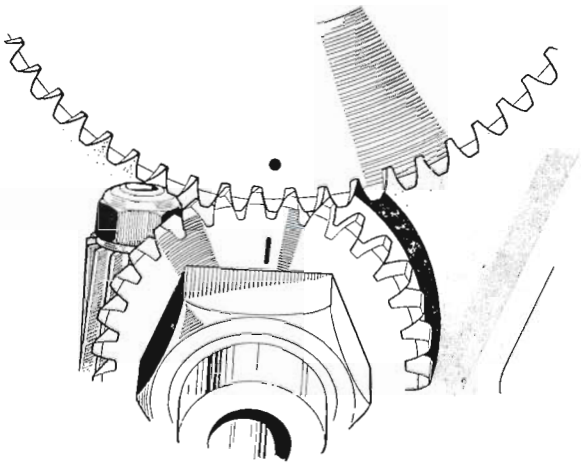


FIG. B.20. *Timing marks.*

The removal of the crankshaft pinion and oil pump worm drive 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.

**Tappets**
Examine both ends of each tappet for signs of excessive wear or chipping and make sure that they are quite free to move in their locations in the crankcase. If there are signs of "scuffing" on the feet, they should be replaced. The cam-

shaft must also be examined as this may be damaged too.

When replacing the tappets, ensure that the small oil holes are facing towards the gearbox with the thinner end of the foot towards the front (as shown in Fig. B.21).

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. Tighten crankshaft pinion nut to torque wrench setting on page H.1.

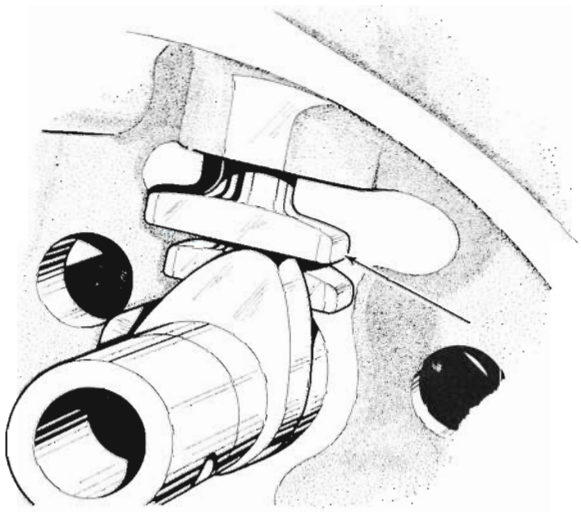


FIG. B.21. *Correct fitting of tappets.*

## GEARBOX DISMANTLING

**Gearchange Mechanism**

First remove the timing covers, as detailed on page B.20.

Press in the cam plate plungers with a suitable flat bladed instrument and withdraw the gear-change quadrant complete with spring.

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

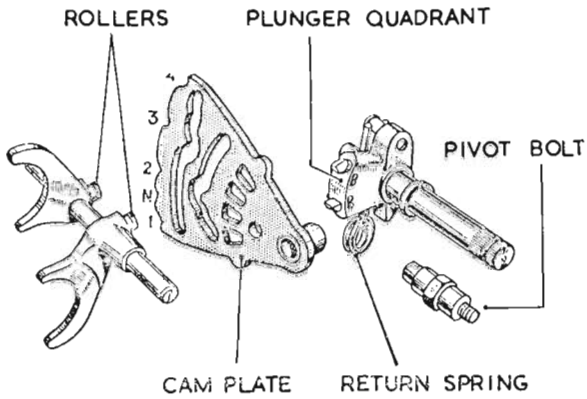



FIG. B.22. *Gearchange mechanism.*

The gearchange return spring pivot bolt need not be disturbed.

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. B.23).

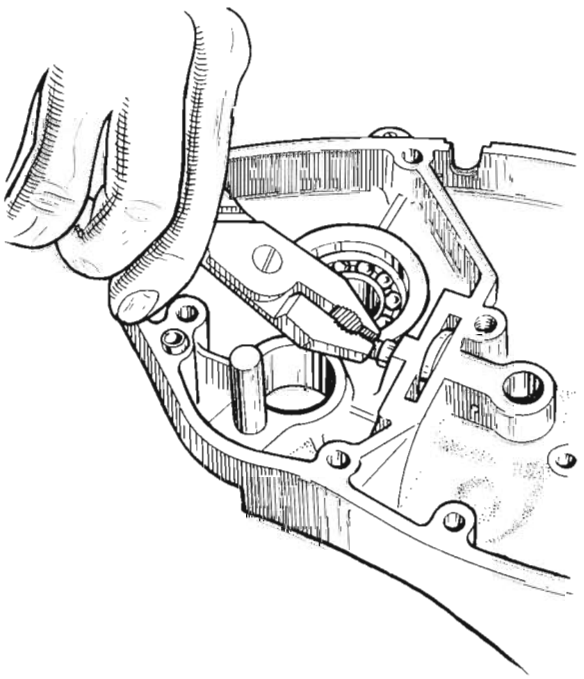


FIG. B.23. *Removing the cam plate pivot pin.*

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. B.25) to ensure correct re-assembly. By fitting the cam plate upside down, the gearchange positions will be reversed.

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 springiness, then they must be replaced.

Any damage or wear to these parts will make a good gearchange impossible.

**Gear Cluster**

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

To remove 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.

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 and in severe cases, might even have broken through the case hardening.

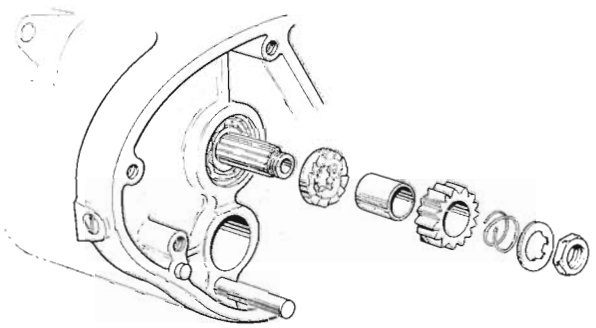


FIG. B.24. *Kickstart ratchet.*

**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 on page B.16), 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.

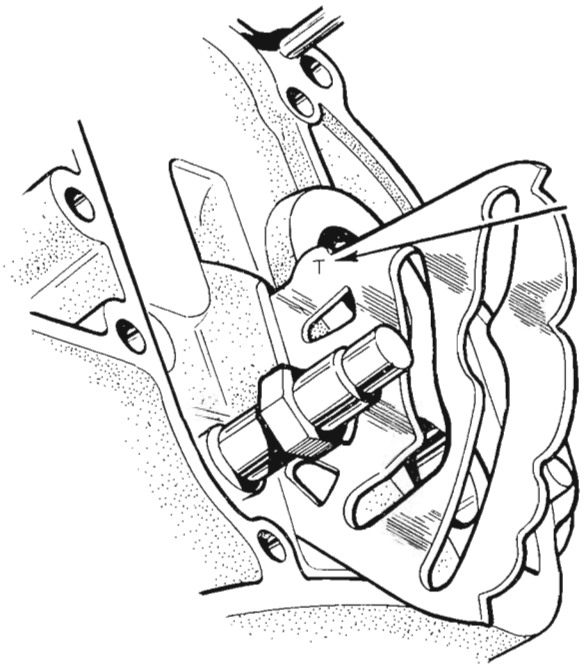


FIG. B.25.

## 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. B.25 for guidance), insert the pivot pin and secure with the split pin.

Insert the mainshaft fitted with its low gear and third gear, into the cover bearing, replace the kickstart ratchet assembly and secure with the fixing nut to torque wrench figures quoted on page H.1. It will be necessary to hold the mainshaft in a vice, using soft metal clamps, to tighten the nut fully.

Holding the cover face down, place the layshaft low gear with its shim (C) Fig. B.26, 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 B.25). 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

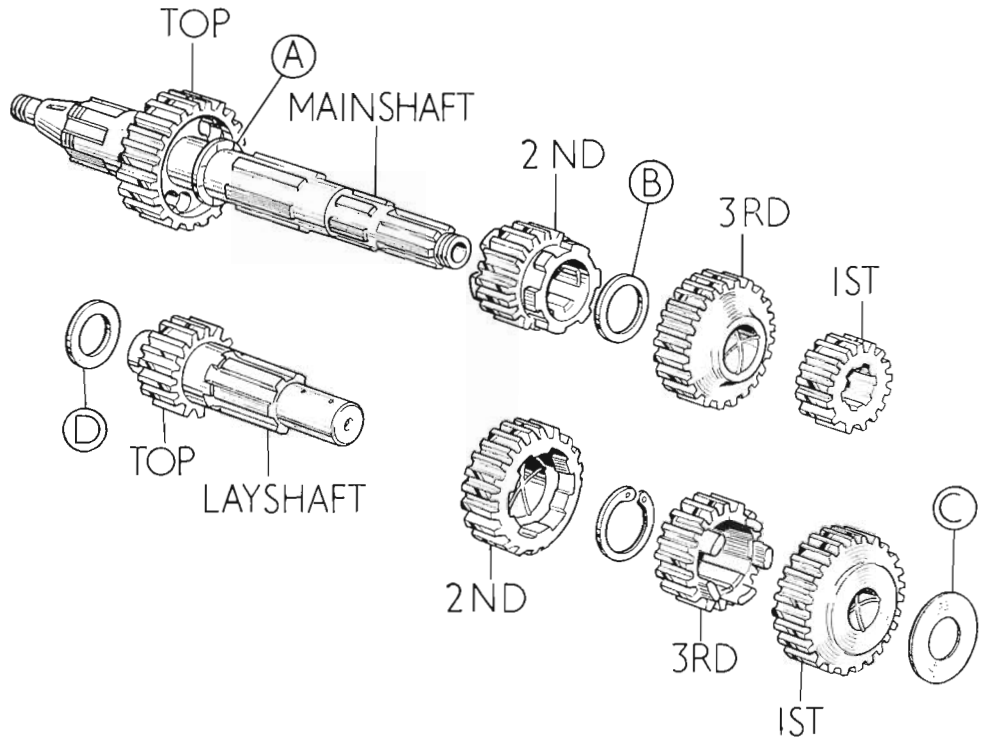



FIG. B.26. *Gear cluster exploded.*

plungers with the cam plate "windows" as the quadrant is pressed home.

A thrust washer (D) is fitted to the drive-side 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. B.26 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)

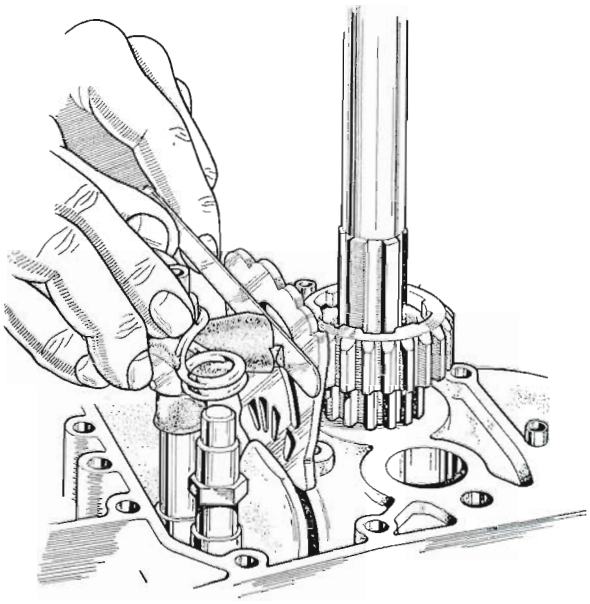


FIG. B.27. *Fitting the gearchange quadrant.*

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

## SEQUENCE OF GEAR CHANGING

To understand this description of the gear changing sequence, it will be necessary to refer to the various drawings and to understand some of the terms used.

(1) CAM PLATE—this is the large fan-shaped component that has "windows" for the gear-change quadrant plungers, cam tracks for the selector fork rollers and notches to locate the gear positions.

(2) CAM PLATE LOCATING SPRING PLATES—these are secured to the crankcase, the larger of which locates in the cam plate notches at various gear positions.

(3) QUANDRANT PLUNGERS—these are held in the gearchange quadrant and operate in the cam plate "windows."

(4) SELECTOR FORKS—each selector fork has a roller which locates in the cam plate tracks. When the cam plate is turned about its pivot pin, these selector forks are moved backwards or forwards.

(5) SLIDING GEARS—both the layshaft and the mainshaft have one sliding gear each. They are operated by the selector forks and are carried along the splined shafts.

The gears must always be in the neutral position for starting the engine, this is the position shown in Fig. B.28.

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

When the pedal is moved down, to engage first gear, the plungers will enter the cam plate and move it to first gear position, this in turn will operate the layshaft selector fork and will mesh the layshaft sliding gear with the layshaft first gear.

Reference to Fig. B.29 will now show the quadrant plunger in the second window ready to move the cam plate from first to second gear.

This time the cam plate moves in the opposite direction and again operates the layshaft selector fork moving the layshaft sliding gear in the opposite direction to mesh with the second gear.

Reference to Fig. B.30 will show both quadrant plungers in the cam plate windows ready to move the gears from second to first or neutral or back again.

When the cam plate is moved to third gear position as will be seen by reference to Fig. B.31, the action moves both selector forks, drawing the layshaft sliding gear to a neutral position and moving the mainshaft sliding gear into mesh with the mainshaft third gear. Again the quadrant plungers are ready to move the gears either way.

Finally, the move into fourth or top gear (Fig. B.32) operates the mainshaft selector fork only, again sliding the gear the opposite way to mesh with the sleeve pinion. After each movement of the gearchange pedal the quadrant returns to a static position so that the plungers are ready to operate the cam plate. The large spring plate at the large end of the cam plate is the positive gear location and it also serves to steady the cam plate whilst the quadrant plungers are returning to their static position.

NOTE:—The cam plate can be reversed if required, to give an opposite gearchange action.

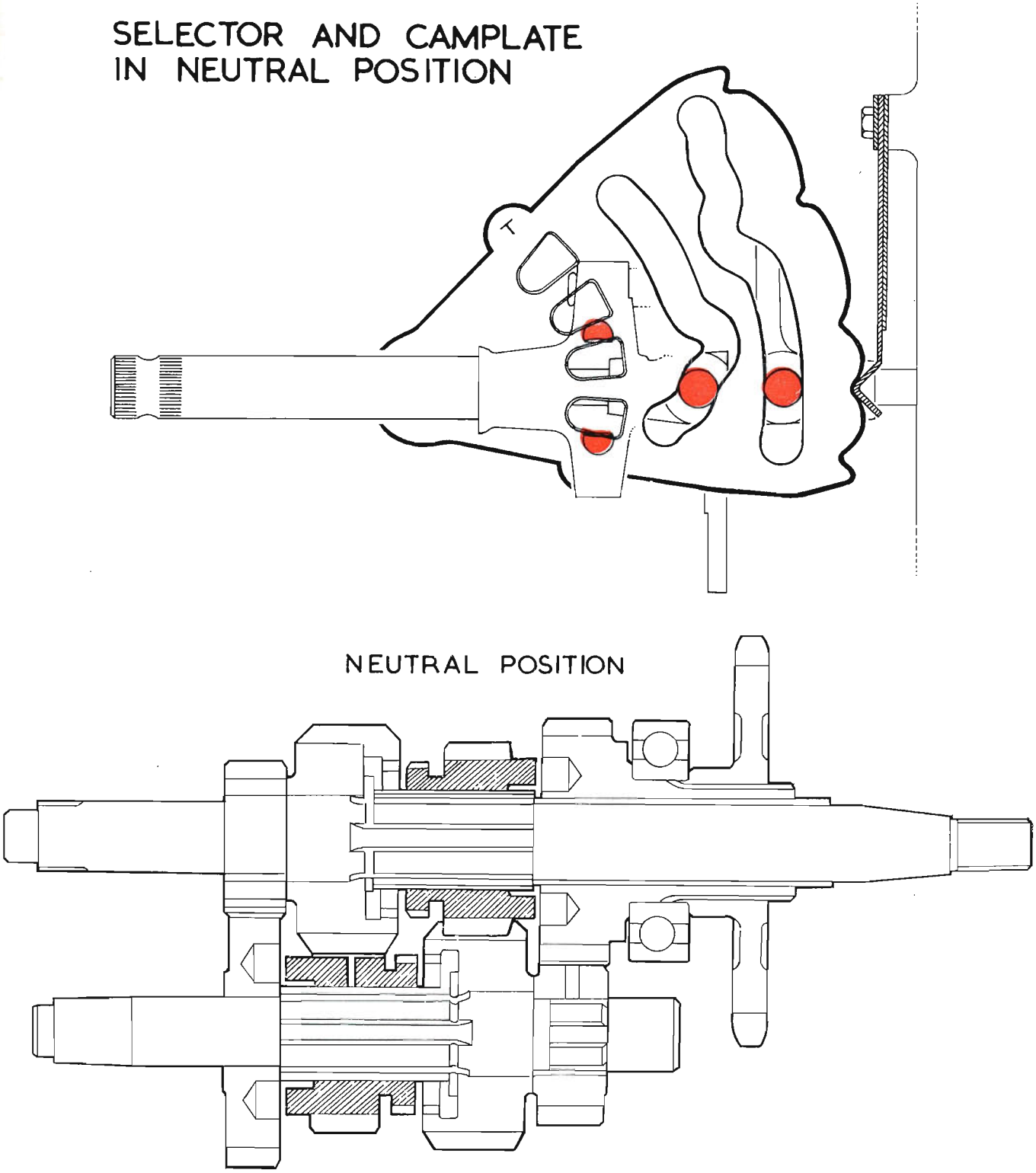



FIG. B.28.

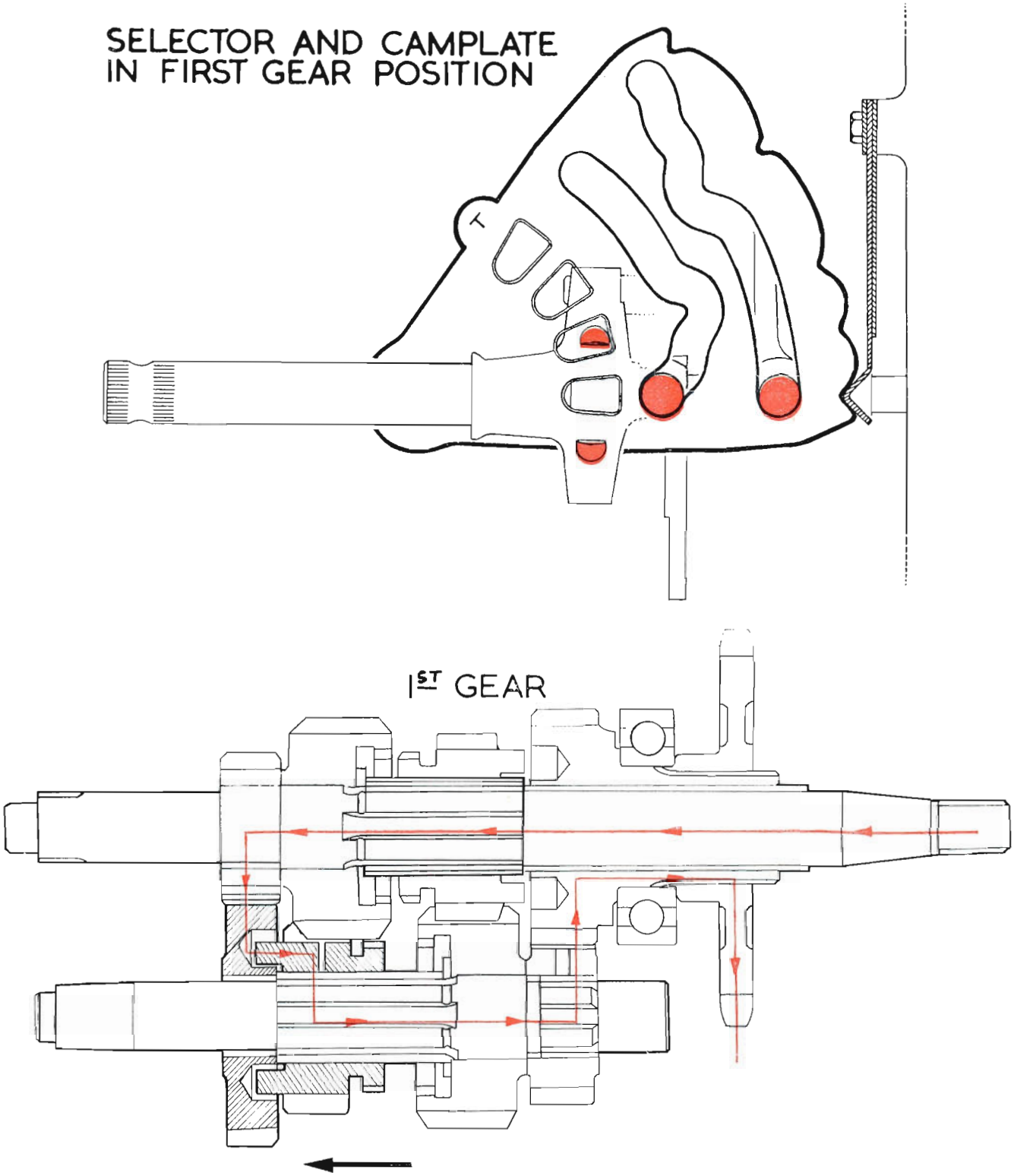
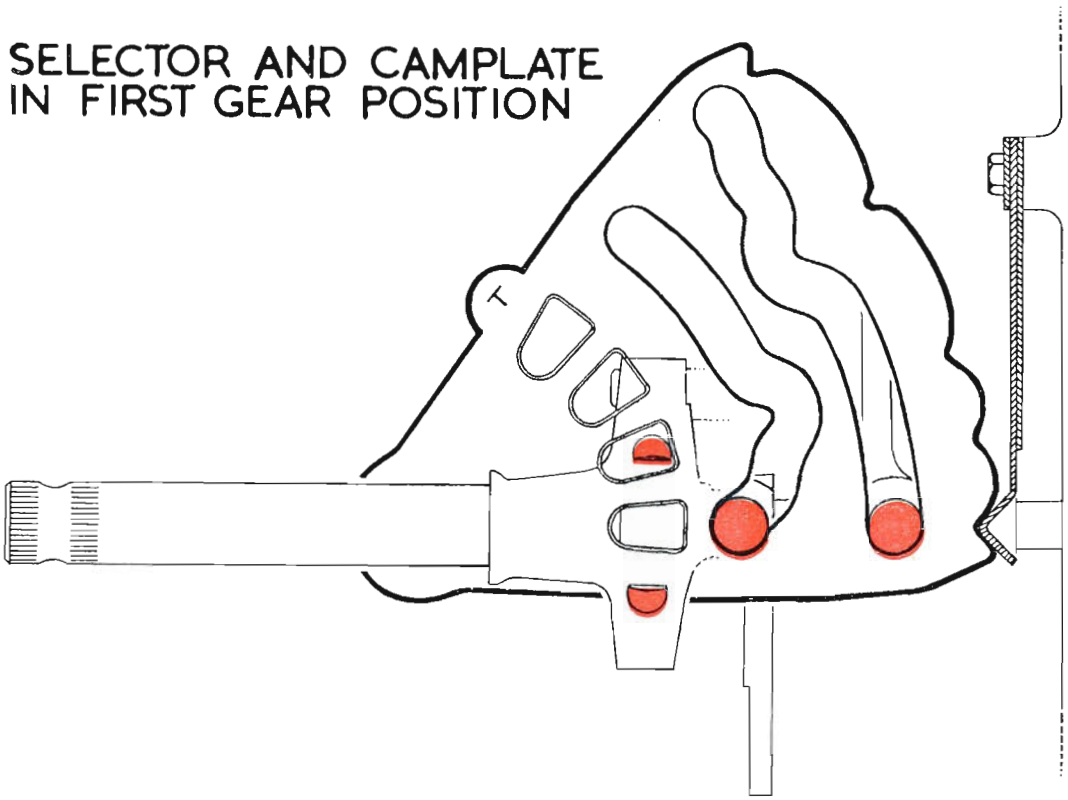



FIG. B.29.



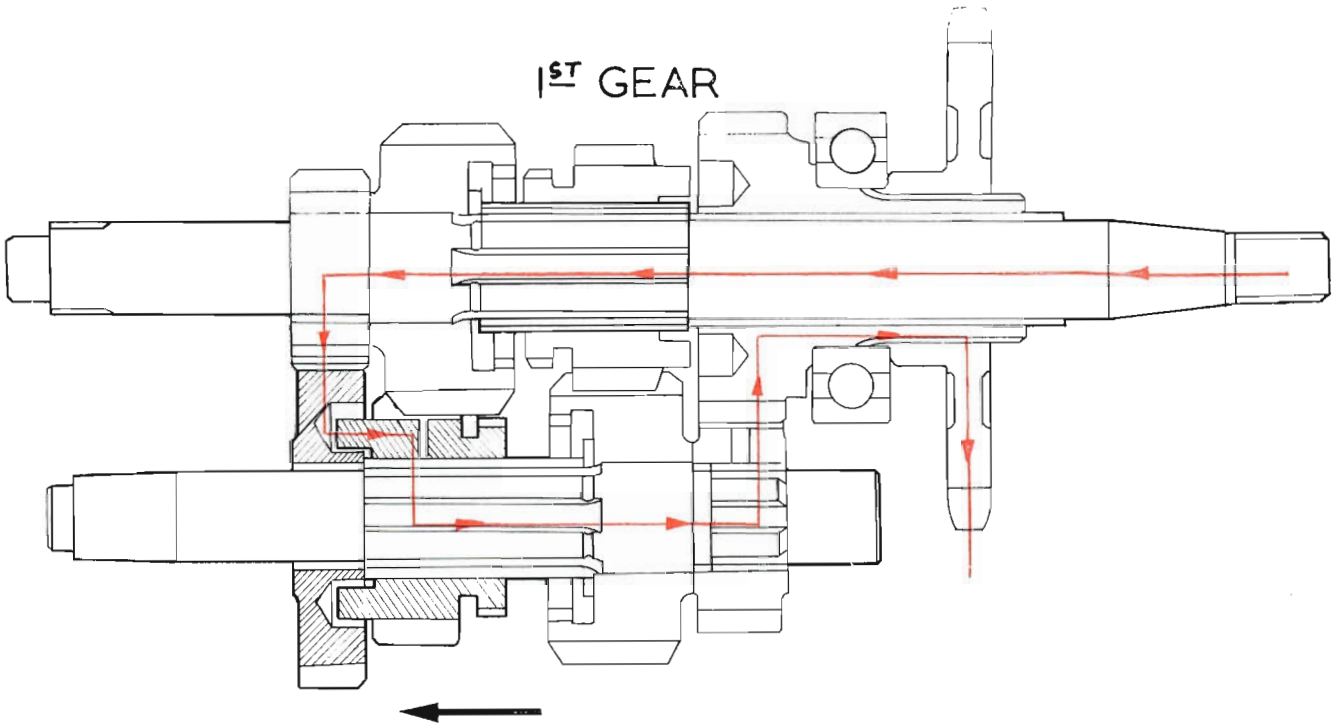




FIG. B.29.

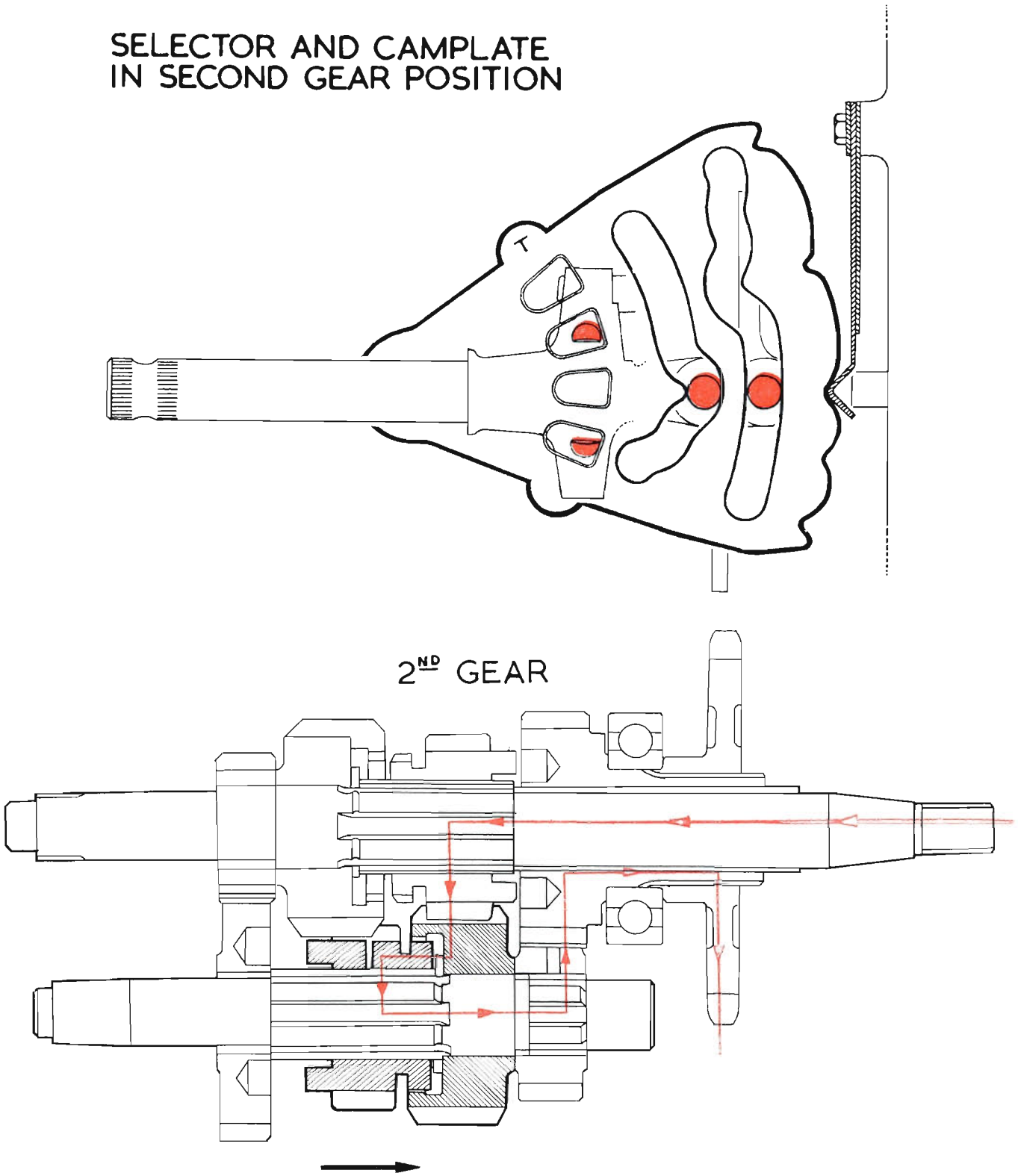



FIG. B.30.

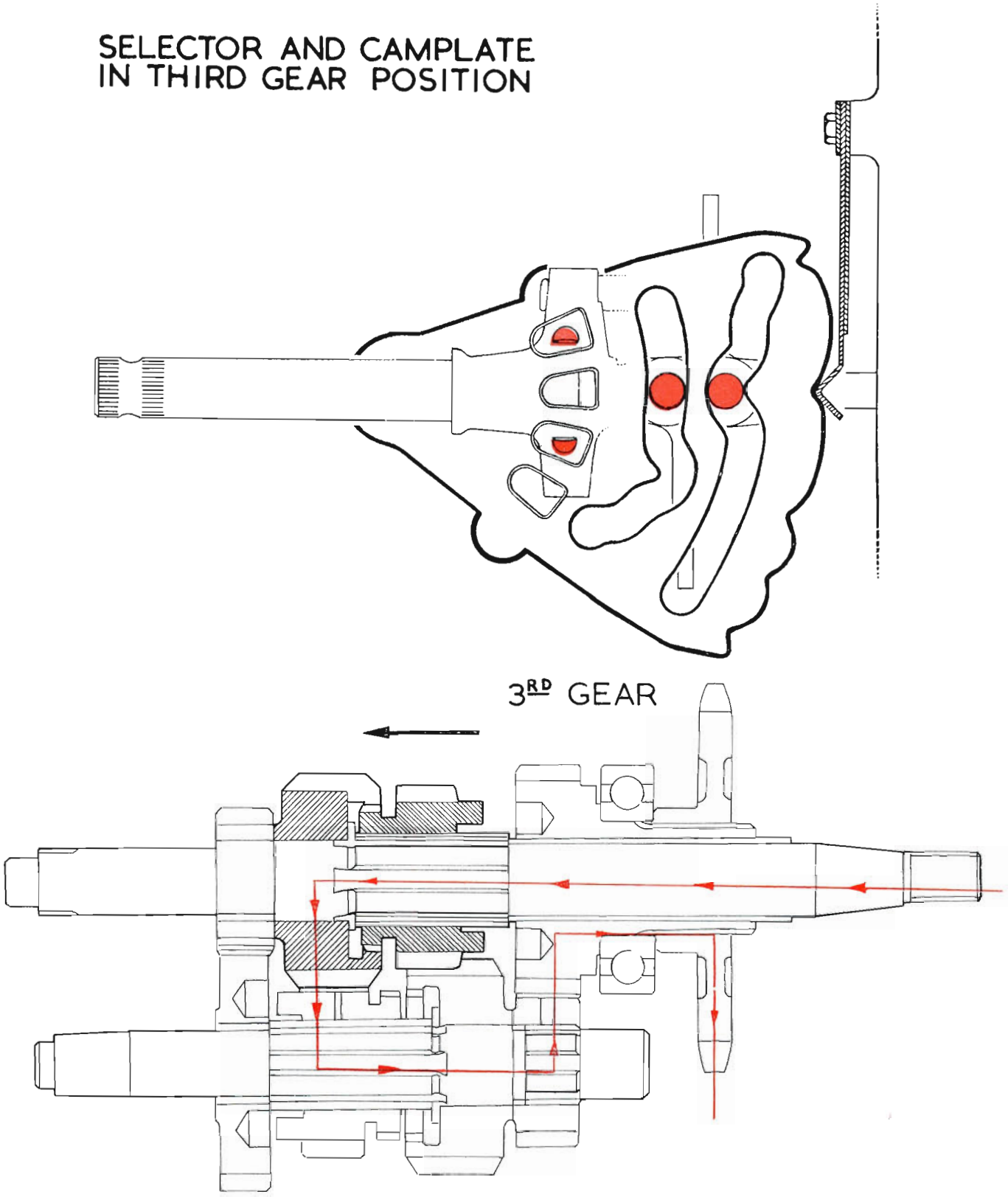



FIG. B.31.

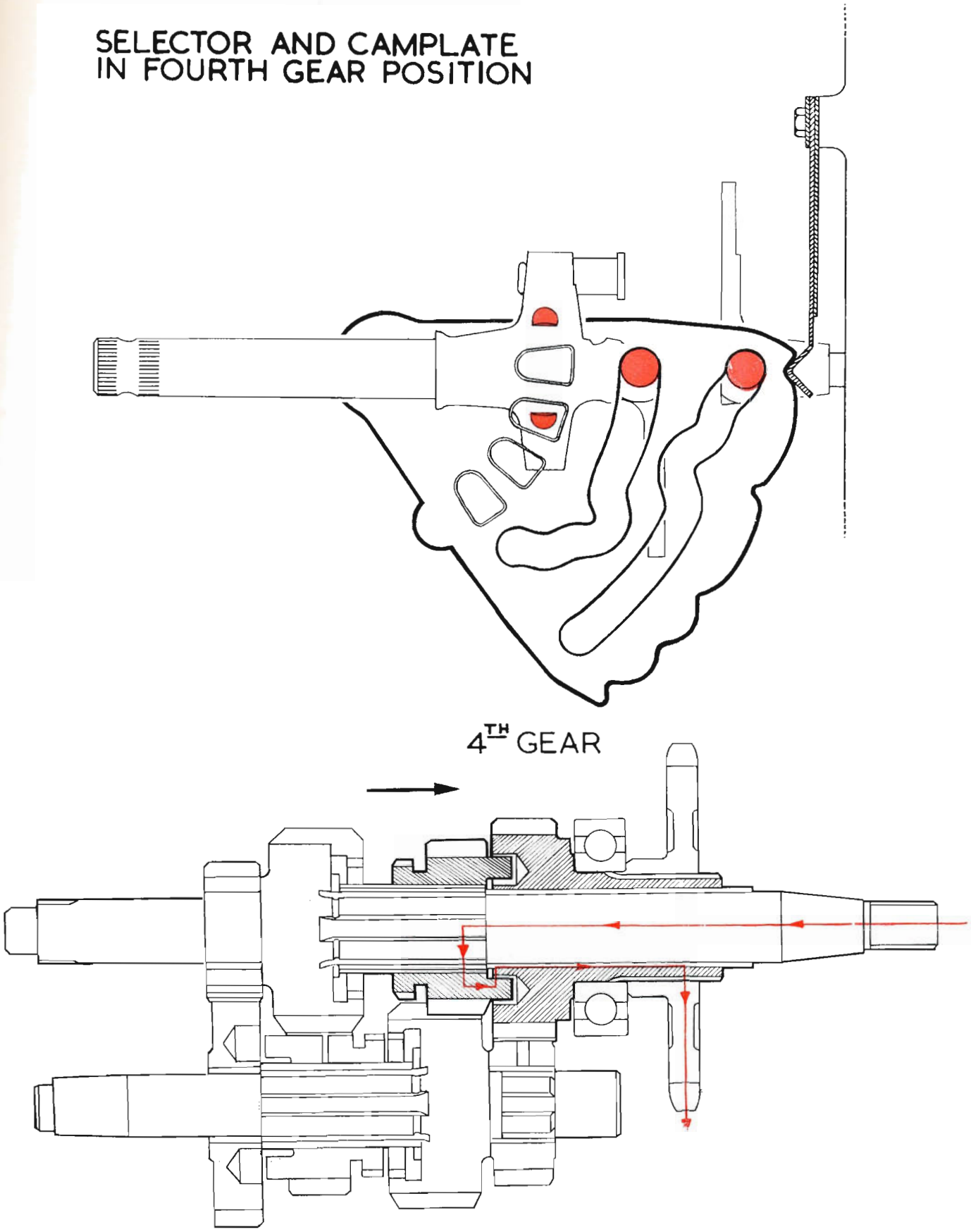



FIG. B.32.

## SPLITTING THE CRANKCASE HALVES

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

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

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. This will only damage the joint faces, resulting in oil leaks. 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.

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

## BIG-END AND FLYWHEEL ASSEMBLY

Opportunity should be taken whilst the flywheel assembly is out of the crankcase, to clean the oil sludge trap, located in the right-hand flywheel. Remove the screwed plug and thoroughly clean out the drilling with paraffin. If possible, use a high-pressure air line to blow through the oil-ways.

Should the big-end and flywheel assembly require replacement, it is advisable to obtain a works reconditioned unit through your dealer. If, however, it has been decided to renew the big-end assembly, first unscrew the large crankpin nuts from each side with socket No. 61–3770.

When parting the flywheels, take care not to lose the small crankpin locating peg in the gear-side flywheel.

After cleaning the big-end assembly, a thorough examination should be made of the crankpin, big-end bush and rollers for wear or damage. Even though the components may not appear to be badly worn, it is recommended that they are checked in accordance with the dimensions quoted on page GD.4 and replaced as necessary.

When reassembling, replace the small crankpin locating peg in the gear-side flywheel and locate the crankpin over the flywheel hole so that the peg will locate with the groove in the tapered face of the crankpin. This ensures that the oil hole in the crankpin will line-up with the oil-way in the flywheel. It is most important that these holes are not obstructed. Press the crankpin firmly in position, then fit the drive-side flywheel. Replace the crankpin nuts and tighten to torque settings on page H.1., to bring the flywheels together on the crankpin.

The flywheel assembly will now have to be "trued."

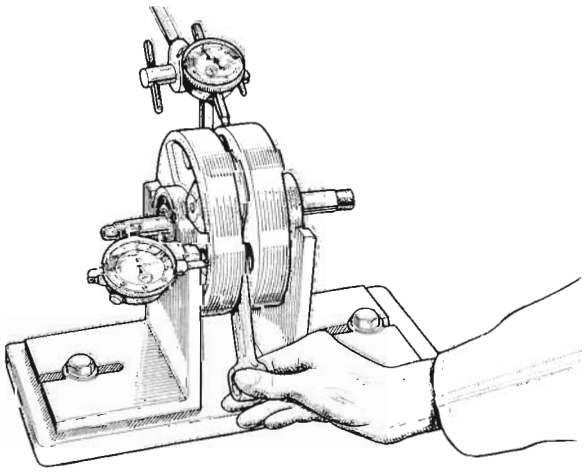


FIG. B.33. *Checking the flywheels.*

Place the bearings on to the shafts and mount the assembly in vee-blocks. True-up the flywheels as indicated in Fig. B.33, using a dial indicator gauge for checking.

Each wheel should be "trued" to within .005 in., the drive-side shaft to within .002 in. and the gear-side shaft to within .0005 in.

## REASSEMBLING THE CRANKCASE

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

Place the flywheel 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 coating of jointing compound to the joint faces of each crankcase half and refit the gear-side 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 flywheel 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.

## IGNITION TIMING

Before carrying out any check on the ignition timing, the contact points gap should first be verified and, if necessary, re-adjusted as described on page B.18.

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.

**Piston Position**

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).

This position can be set most accurately with the aid of a degree plate. The primary chaincase should first be removed and the degree plate mounted centrally on the engine shaft (see Fig. B.34). A suitable pointer should then be attached to some convenient part of the engine with the point adjacent to the plate.

On 1968 models there is a pointer mounted at the base of the inspection aperture which is situated at the front of the primary case. Also a mark is scribed on the generator rotor (see Fig. B.34A).

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

Rotation of the engine through several degrees near the top dead centre position produces very little piston movement, making the top dead centre position extremely difficult to find. Is is preferable, therefore, to use a suitable stop (such as a dummy plug with a projection into the cylinder head) so that the piston can be brought

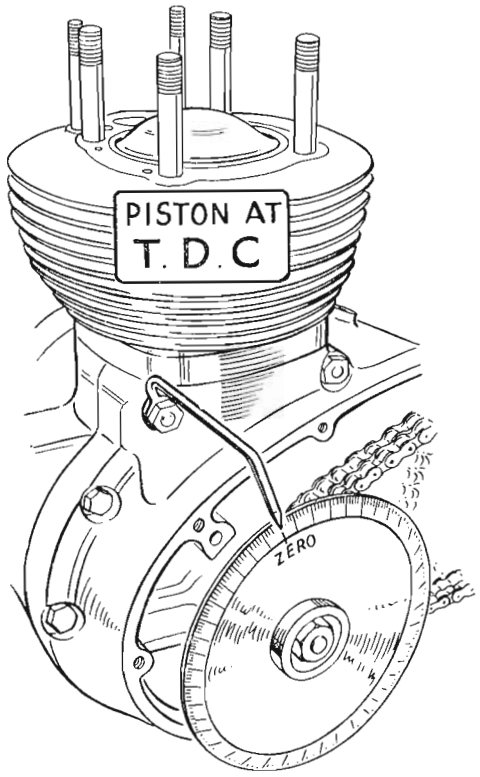



FIG. B.34.

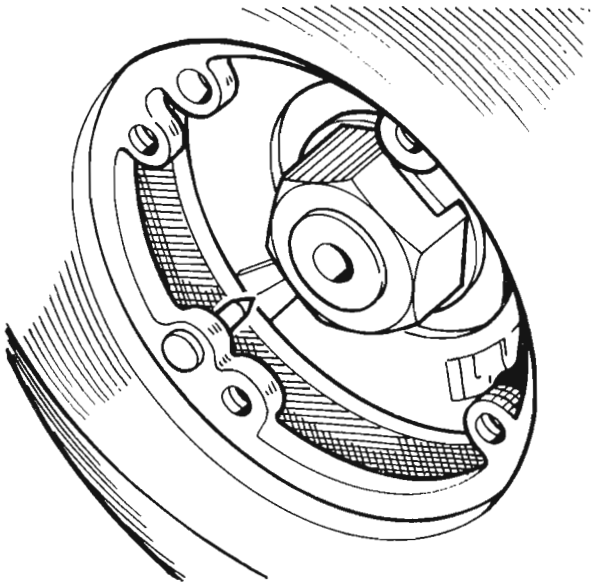


FIG. B.34A.

gently against it by rotating the engine as far as it will allow in each direction. If degree plate readings are taken in each position and the point mid-way between them is calculated, this will be the precise top dead centre.

Having determined top dead centre of the piston, set the pointer to the zero mark on the degree plate.

Rotate the engine backwards about 45° then bring it forward slowly to the desired reading of 28° on the plate.

Alternatively a dial indicator can be used to measure the piston movement. It must be mounted on to the cylinder head with its long rod projecting through the sparking plug hole.

At piston top dead centre position the dial should read zero. The engine must then be rotated until the piston position is at .265 in. before top dead centre on the compression stroke.

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, that is the point at which the compressed charge in the combustion chamber is ignited, is to set it statically.

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

The automatic-advance functions by centrifugal force acting on spring-loaded bob-weights which will advance the ignition timing as the engine revolutions rise. Since exact timing accuracy is required at operating speeds it is better to time the engine in the fully advanced

position so transferring any variations in the firing to the tick-over or low engine speeds when it can least affect the performance.

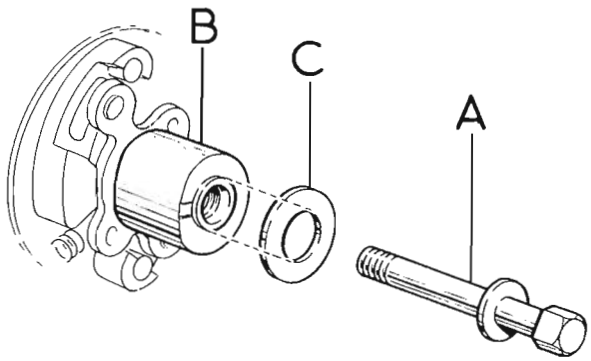



FIG. B.35. *Setting the contact breaker cam.*

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

Carefully remove the central fixing bolt (A) with washer from the contact breaker cam (B) and temporarily fit another washer (C) having a hole just large enough to clear the cam inner bearing (see Fig. B.35), 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 piston at 28° or .265 in. before top dead centre, 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. B.36).

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

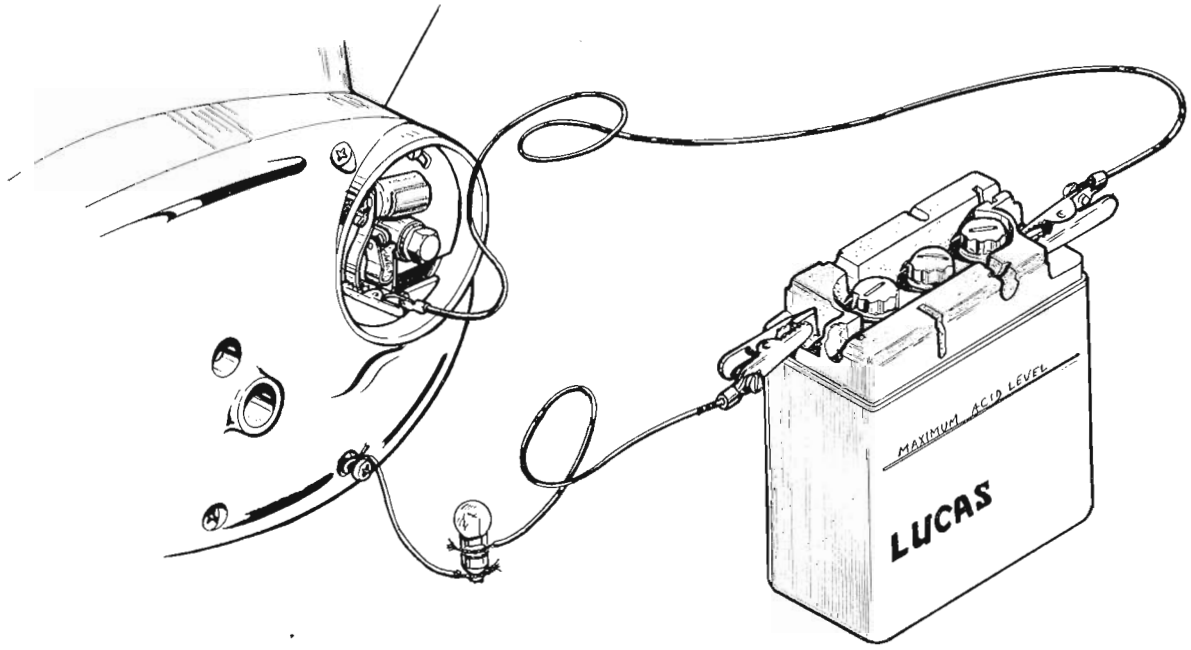



FIG. B.36. *Battery and bulb in circuit.*

the base of the bulb to a good earthing point on the machine.

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

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

Hold the plate in this position, tighten the pillar bolts and recheck 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.

Some dealers possess electronic 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 Strobescope**
All 1967 Victor models made on and after engine No. B44EA.101 have provision for checking the ignition timing with the aid of a strobe light.

Remove the small inspection cover at the forward end of the primary drive case to expose the generator rotor. It will be seen that a timing mark is scribed on to the face of the rotor and that a pointer is mounted on the base of the inspection aperture.

NOTE:—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, 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 r.p.m.

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″ the timing will be advanced by 1°. By closing the gap by .001″ the timing will be retarded by 1°.

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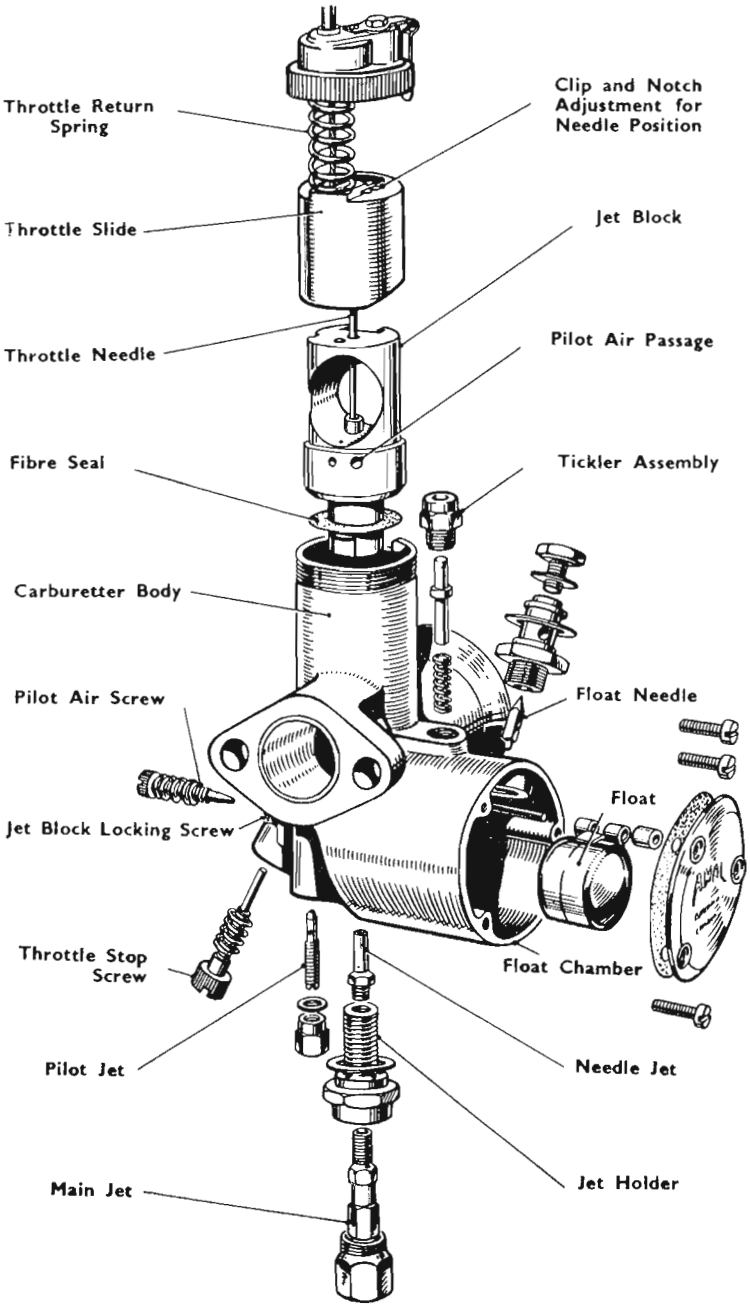



FIG. C.1. *Carburetter exploded.*
*(Fitted up to Engine No. B44EA.101 on Victor Enduro and Special (U.S.A.) models).*

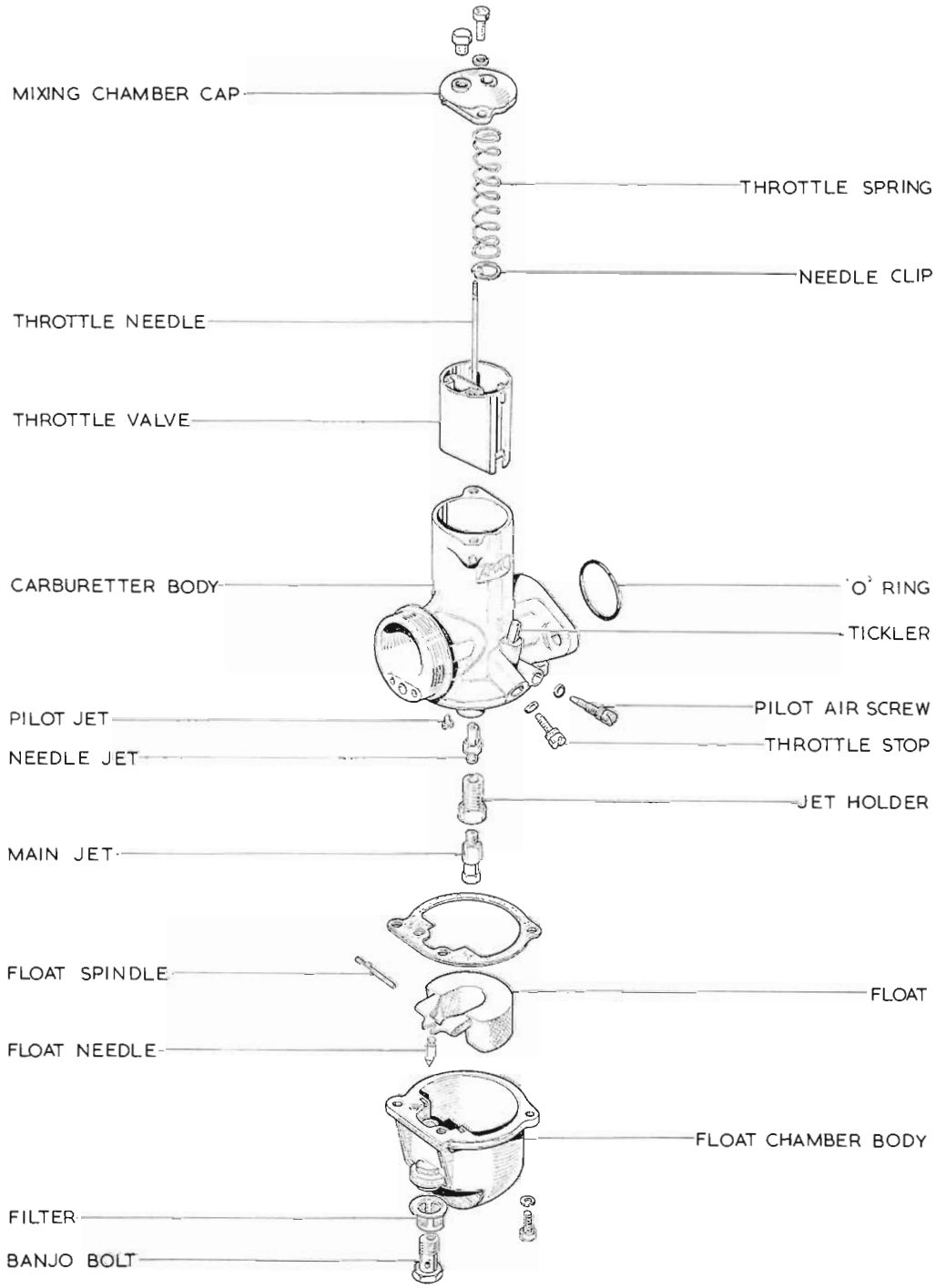



FIG. C.2. *Carburetter exploded—concentric float chamber. (Fitted on and after Engine No. B44-EA101 on Victor Enduro and Special (U.S.A.) models only).*

## DESCRIPTION

The Victor Grand Prix, the Victor Enduro and Special (U.S.A.) are fitted with Amal Monobloc carburetters, the only variation being that a larger main jet is used on the Enduro and Special (U.S.A.) carburetter.

Later Enduro and Special (U.S.A.) models (on and after Engine No. B44EA.101) are fitted with a concentric float chamber carburetter.

The carburetter, because of its jets and choke bore, proportions and atomises just the right amount of petrol and air which provides a highly inflamable mixture. The mixture is drawn into the engine and ultimately burnt within the cylinder head, 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 handle-bar twist grip, controls the volume of mixture and therefore the power.

When the engine is ticking-over, the mixture is supplied by the 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 of which, being controlled by the taper needle in the needle jet.

The pilot supply is controlled by a jet which can easily be removed for cleaning purposes. When assembled in the carburetter body, the pilot jet is sealed by a cover nut. On later Victor Enduro and Special (U.S.A.) models (on and after Engine No. B44EA.101) the pilot jet is situated within the concentric float chamber.

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 serve 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.

## DISMANTLING AND REBUILDING THE CARBURETTER

First, remove the two fixing nuts and withdraw the carburetter from its studs; it will not be necessary to disconnect the cable from the twist grip.

Unscrew the mixing chamber top ring and withdraw the top cap with throttle slide, spring and needle. Remove the needle retaining spring clip and take out the needle. By compressing the slide return spring, the cable nipple can be pushed down and out of the slide.

Unscrew three slotted screws and take off the float chamber cover. The float spindle bush, float and float needle can now be withdrawn.

Take out the "banjo" bolt which secures the fuel pipe "banjo" connector to the float needle seating block and withdraw the "banjo" filter and washers.

The needle seating block may now be un-screwed from the float chamber top.

Unscrew the tickler (or primer) body and take out the tickler with spring.

Remove the pilot air screw and the throttle stop screw, then take out the main jet cover nut from below mixing chamber.

Unscrew the main jet, main jet holder and needle jet. To release the jet block, it may be necessary to re-insert the main jet holder, until a few screw threads are engaged then tap it with a hide-mallet. This will release the jet block through the top of the carburetter body.

Unscrew the pilot jet cover and screw out the pilot jet. All that remains to be removed at this stage is the hexagonal locating peg, the end of which can be seen protruding within the mixing chamber.

Carefully clean all parts in petrol (gasoline). Hard deposits on the carburetter body are best removed with a light grade wire brush. After washing the parts several times each in clean

petrol, allow to dry. To ensure that all holes and drillings are free of dirt and are not blocked, blow through with a jet of compressed air (a hand pump is ideal for this operation).

Inspect the component parts for wear and check that the jets are in accordance with the recommended sizes given in General Data.

Apart from the few points mentioned below, reassembly is a reversal of the above instructions. Refer to Fig. C.1 for guidance.

Do not replace any fibre washer that looks unserviceable. It is advisable to buy a set of replacement washers before dismantling the carburetter.

When replacing the jet block, ensure that the fibre seal is in position; locate the slot in the jet block with the peg in the carburetter housing and drive the block home.

Before screwing down the mixing chamber top ring, check that the top cap locating peg is correctly fitted in the slot in the top edge of the mixing chamber.

Finally, when replacing the float note that the front is marked to assist in reassembly. Do not omit to fit the float spindle bush on the outside end of the spindle.

### DISMANTLING AND REBUILDING THE CARBURETTER (Concentric Float Chamber)

Unscrew 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 pilot jet, 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 (or primer) consists of a spring and plunger, splayed at one end to retain it in the mixing chamber. This item should not be subjected to a great deal of wear and is therefore unlikely to require replacement.

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

Reassembly is simply a reversal of the above instructions but remember to replace any gaskets or "O" rings that appear unserviceable. Refer to Fig. C.2 for guidance.

### INSPECTING THE CARBURETTER COMPONENTS

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

(1) Inspect the throttle valve slide for excessive scoring of the front area and check the extent

of wear on the rear slide face. If wear is apparent, the slide should be renewed; be sure to fit slide with correct degree of cut-away (see General Data).

(2) Check the throttle return spring for efficiency. Check also that it has not lost its compressive strength by measuring the free length and comparing it with the figure given on page GD.4.

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

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

(5) Ensure that the float is not punctured by shaking it to see if it contains any fuel. Do not attempt to repair a damaged float. A new one can be purchased for a small cost.

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

## HINTS AND TIPS

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

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

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

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

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

**Carburetter Air Leaks**

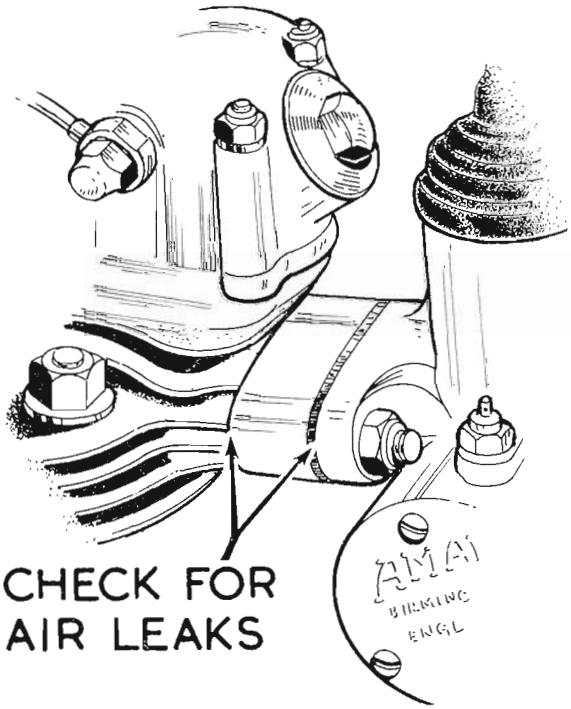



FIG. C3..

Erratic slow-running is often caused by air leaks between the joints at the carburetter flange and the cylinder head (see Fig. C.3) and can be detected by applying oil around the joints. Eliminate by fitting new washers and tightening the flange nuts evenly to a torque wrench setting quoted on page H.1.

Also check that the rubber sealing ring in the

carburetter flange is undamaged and located correctly.

On much used or old machines look for air leaks caused by a worn throttle or a worn inlet valve guide.

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

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

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

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

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

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

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

No adjustment can be made to compensate for lost power due to rarified air.

## TRACING FAULTS

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

**Indications of Richness**
Black smoke in exhaust
Petrol spraying out of carburetter
Four-strokes, eight-stroking
Two-strokes, four-stroking
Heavy lumpy running
Sparking plug sooty

**Indications of Weakness**
Spitting back in carburetter
Erratic slow-running
Overheating
Engine goes better if throttle is almost closed

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

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

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

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

(4) Air cleaner choked-up.

(5) An air cleaner having been removed.

(6) Removal of the Silencer (Victor Enduro and Special (U.S.A.) models only)—this requires a richer setting.

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

To remedy, proceed as follows:—

**To Cure Richness**

Position 1. Fit smaller main jet.
Position 2. Screw out pilot air adjusting screw.
Position 3. Fit a throttle with a larger cut-away (see paragraph E, page C.9).
Position 4. Lower needle one or two grooves (see paragraph D, page C.9).

**To Cure Weakness**

Position 1. Fit larger main jet.
Position 2. Screw pilot air adjusting screw in.
Position 3. Fit a throttle with a smaller cut-away (see paragraph E, page C.9).
Position 4. Raise needle one or two grooves (see paragraph D, page C.9).

(Positions 1, 2, 3 and 4 refer to positions of throttle openings as shown in Fig. C.5, page C.9).

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

## VARIABLE SETTINGS AND PARTS

Figure C.4 is a three-section diagram of the carburetter body, showing the throttle adjusting screw (A), and the pilot air adjusting screw (B).

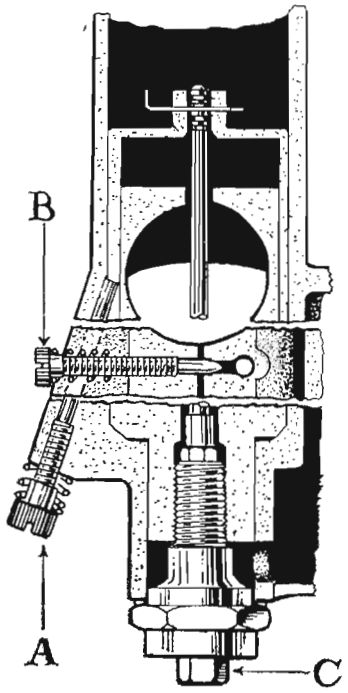


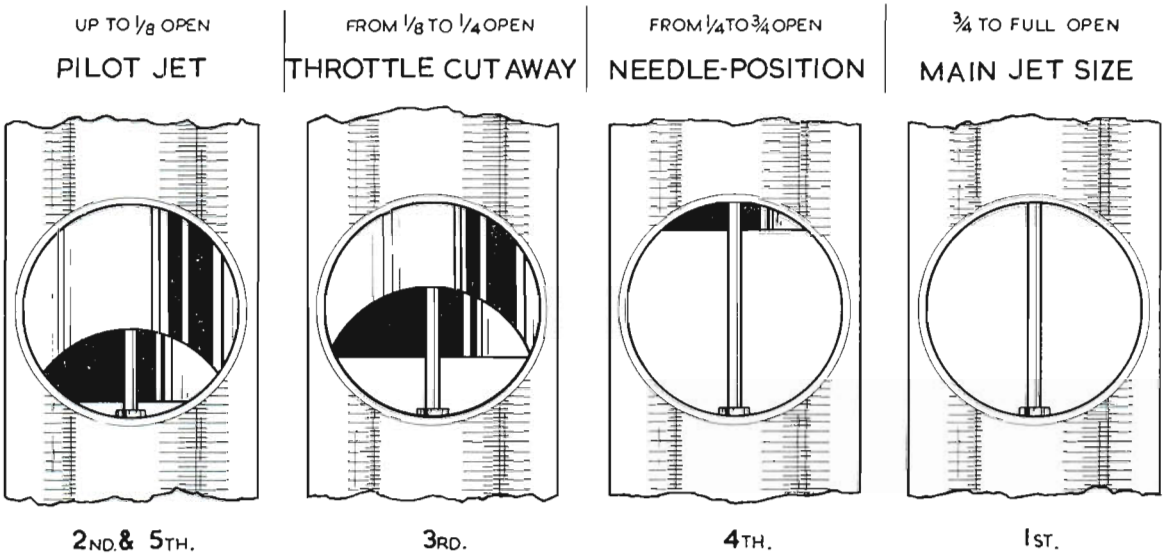
FIG. C.4.

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

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

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

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




SEQUENCE OF TUNING

FIG. C.5.

To remove the main jet unscrew the main jet cover, the exposed main jet can then be unscrewed from the jet holder.

To gain access to the main jet on carburetters fitted with the concentric float chamber the float chamber must first be removed (two screws).

(D) **Needle and Needle Jet** (Fig. C.4)
The needle is attached to the throttle valve and being taper—either allows more or less petrol to pass through the needle jet as the throttle is opened or closed throughout the range, except when idling or nearly full throttle. The taper needle position in relation to the throttle opening can be set according to the mixture required by fixing it to the throttle valve with the jet needle clip in a certain groove, thus either raising or lowering it. Raising the needle richens the mixture and lowering it weakens the mixture at throttle openings from quarter- to three-quarters open.

(E) **Throttle Valve Cut-away**
The atmospheric side of the throttle is cut away to influence the depression on the main fuel supply and thus gives a means of tuning between the pilot and needle jet range of throttle opening. The amount of cut-away is recorded by a number marked on the throttle valve, viz. 389/3½ means throttle valve type 389 with number 3½ cut-away; larger cut-aways, say 4 and 5, give weaker mixtures and 2 a richer mixture.

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

## TUNING THE CARBURETTER

**Tune up in the following order**
Read remarks on pages C.7–8 for each tuning device and get the motor going perfectly on a quiet road with a slight up-gradient so that on test, the engine is pulling under load.

1ST **Main Jet** with throttle in position 1. Fig. C.5. If at full throttle the engine runs "heavily", the main jet is too large. If at full throttle, the engine seems to have better power when the throttle is eased off or the carburetter intake is slightly covered, then the main jet is too small.

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

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

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

3RD **Throttle Cut-away** with throttle in position 3 (Fig. C.5). If, as you take off from the idling position, there is an objectionable spitting from the carburetter, slightly richen the pilot mixture by screwing in the air screw. If this is not effective, screw it back again, and fit a throttle with a smaller cut-away. If the engine jerks under load at this throttle position and there is no spitting, either the jet needle is much too high or a larger throttle cut-away is required to cure richness.

4TH **Needle** with throttle in position 4 (Fig. C.5). The needle controls a wide range of throttle openings and also the acceleration. Try the needle in as low a position as possible, viz with the clip in a groove as near the top as possible; if acceleration is poor and with the carburetter inlet partially covered, the results are better, raise the needle by two grooves; if very much better try lowering the needle by one groove and leave it where it is best. If mixture is still too rich with clip in groove number 1 nearest the top, the needle jet probably wants replacement because of wear. If the needle itself has had several years' use replace it also.

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

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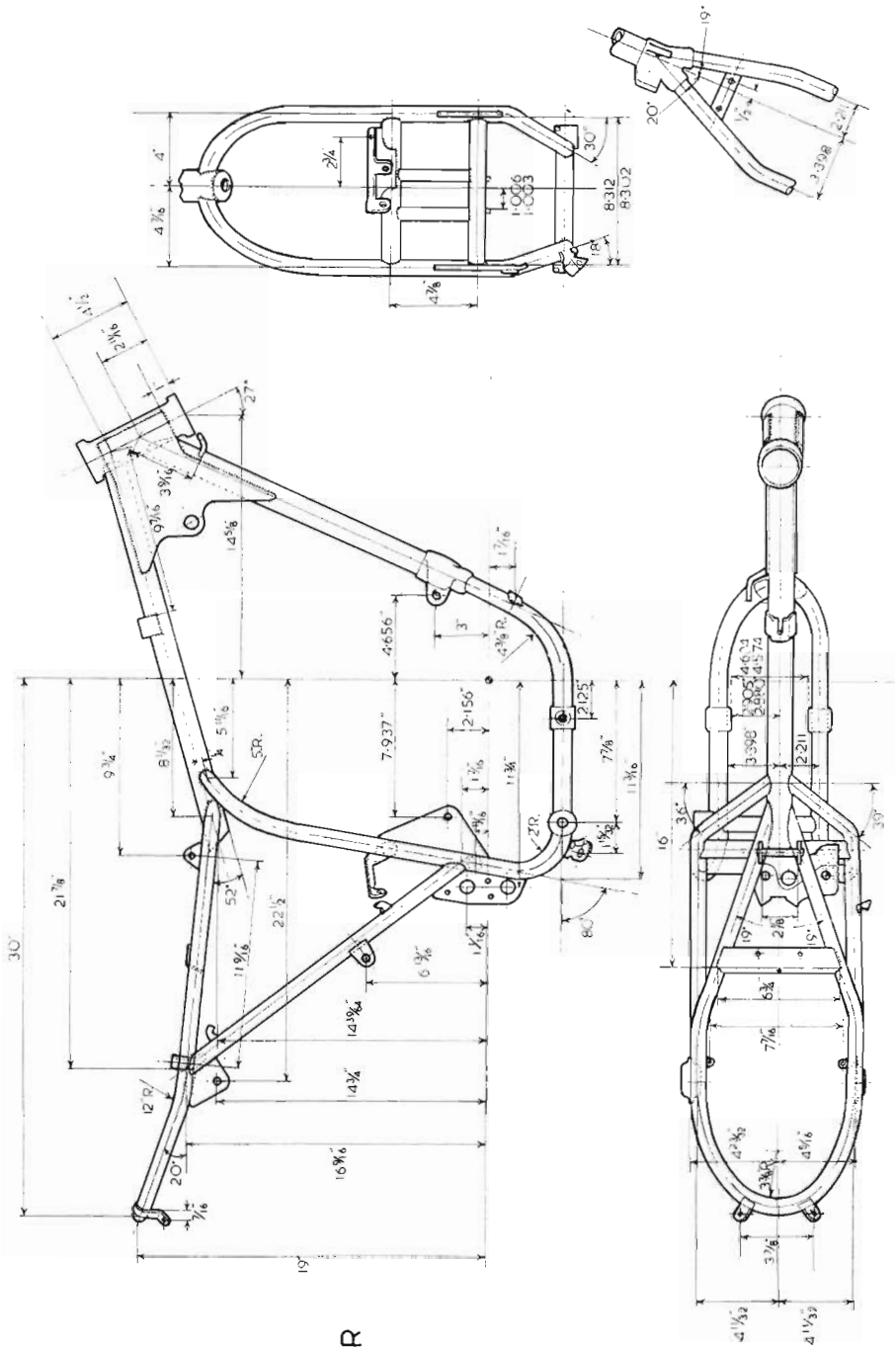

B44 VICTOR
ENDURO

FIG. D.1.

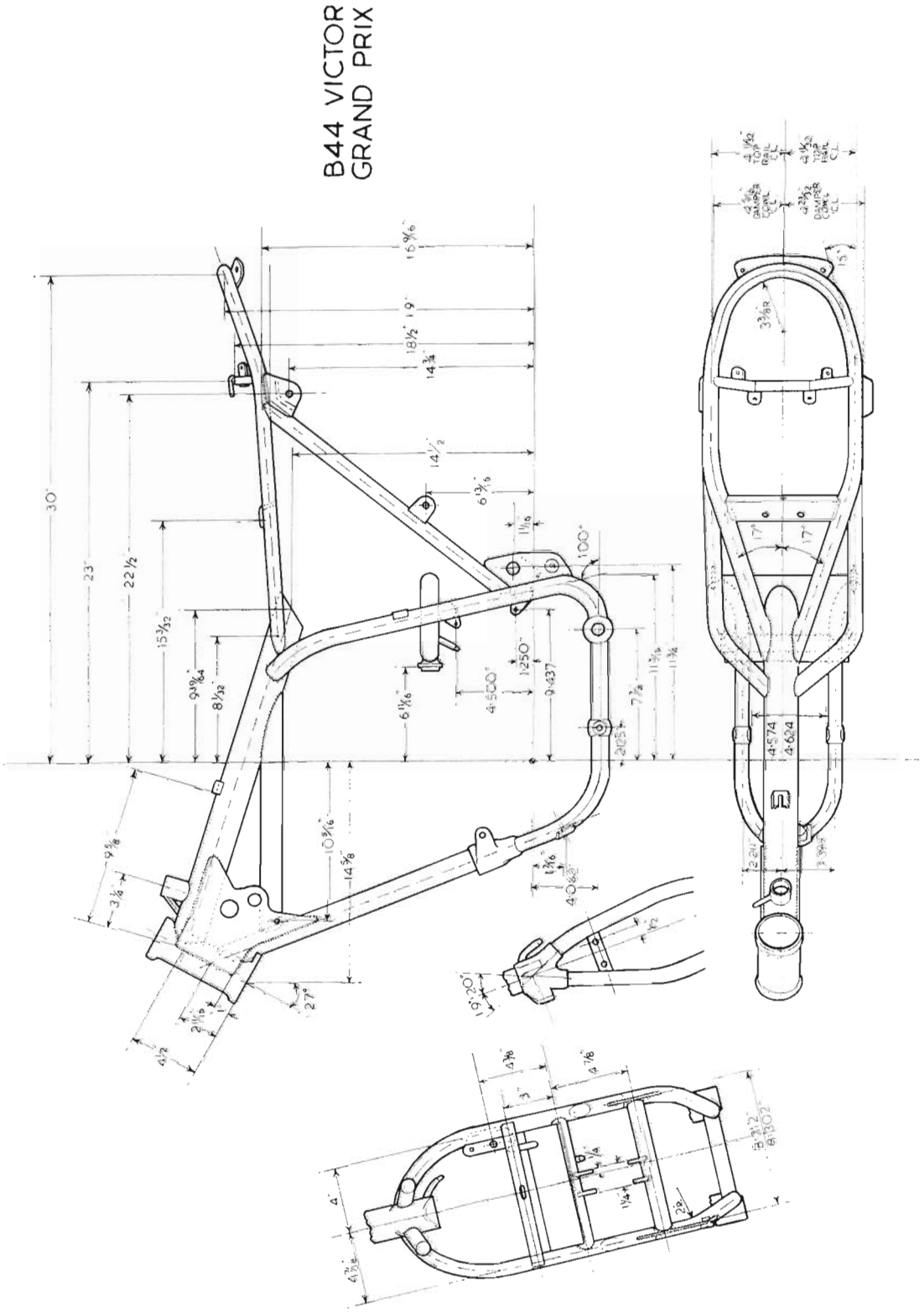


FIG. D.2.

## FRAME ALIGNMENT

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

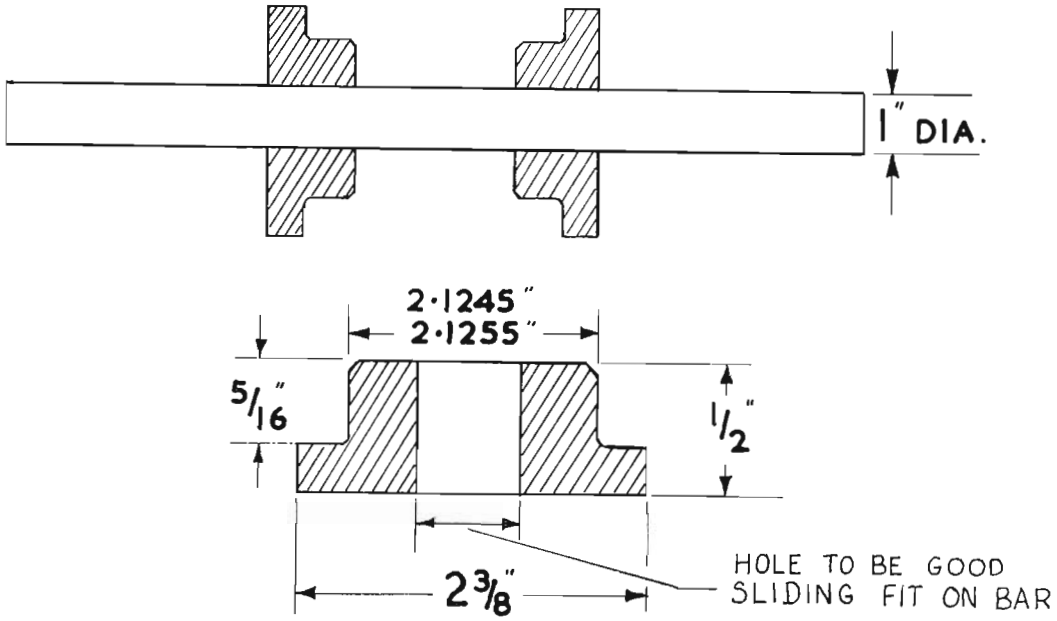


FIG. D.3. *Steering head mandrel.*

One mandrel and two blocks, as in Fig. D.3

One mandrel or bar for swinging arm pivot, 13/16 in. diameter by 12 in. long.

One large set-square.

One 18 in. vernier height gauge or large scribing block.

One pair of large "V" blocks and several adjustable height jacks

If a scribing block is used, then an 18 in. steel rule will also be required. The mandrels must be straight and round, otherwise measurements will be affected. Figure D.4 shows the basic set-up for checking the Victor Enduro and Special (U.S.A.) frame. A similar set-up must be used for the Victor Grand Prix, though variations can of course be used according to the facilities available.

Place the blocks into the steering head, insert the mandrel and support with the "V" blocks at one end of the table. Check the mandrel at each end to ensure that it is parallel with the surface of the table. Insert the 13/16 in. diameter mandrel through the swinging arm pivot hole.

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

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

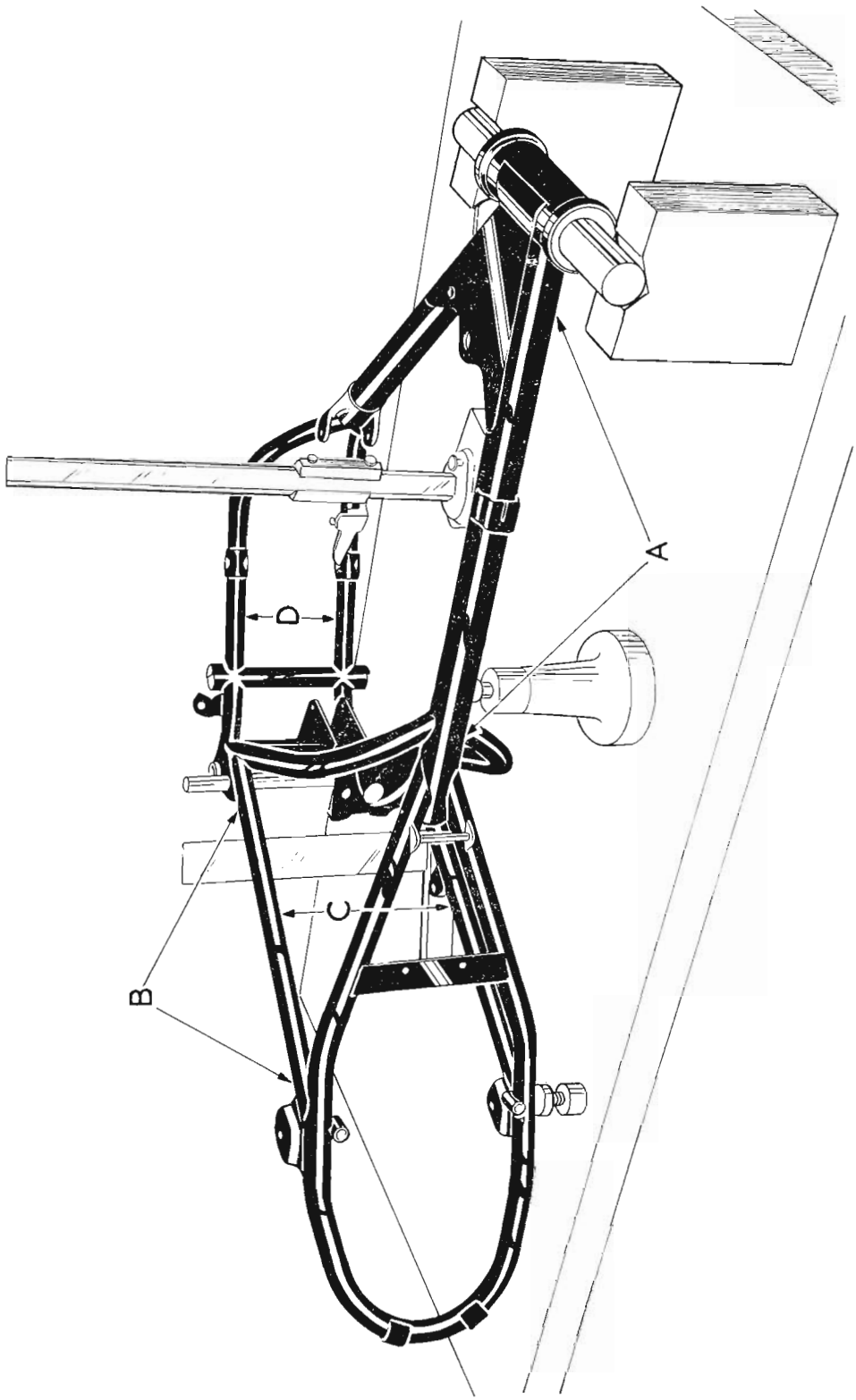


FIG. D.4. *Setting-up the frame.*

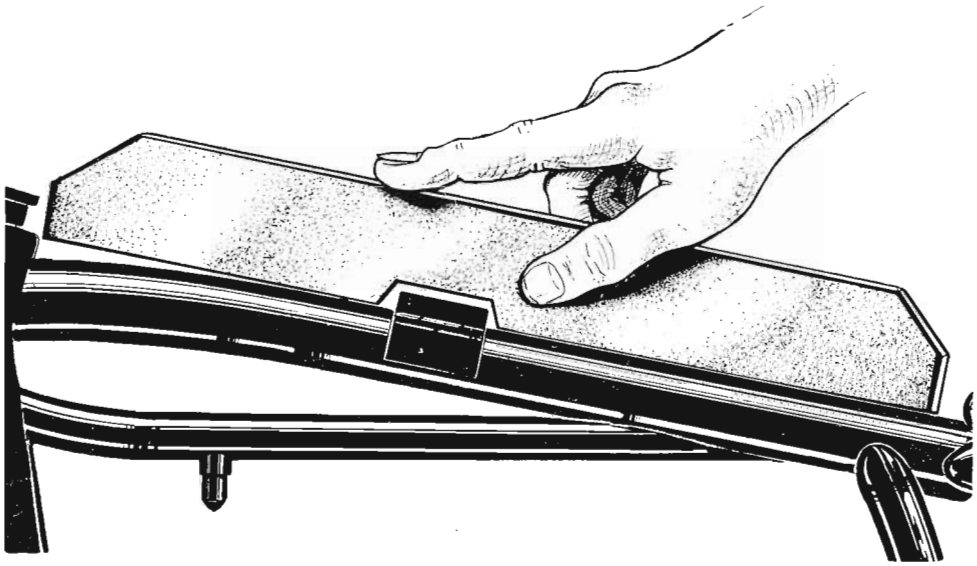

FIG. D.5. *Showing bent top tube.*

Sometimes if the machine has been subjected to a frontal impact, the main tube may remain parallel at points (A) but will be bent as shown in Fig. D.5. A straight-edge, made from a piece of good quality hardboard can be used for this purpose, but the checking edge must be quite straight.

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

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

**CHAINGUARD (Victor Enduro and Special (U.S.A.) models only)**

Before the chainguard can be taken off, the rear wheel must first be removed, see pages F.7–8 or F.9.

Take out the remaining bolt and nut, securing the chainguide and chainguard to the swinging arm lug, unscrew the small screw at the base of the chainguide, and take off the guide. Finally, release the front fixing bolt and nut and withdraw the chainguard from the rear.

Replacement is simply the reversal of the removal procedure.

**REAR SHOCK ABSORBERS**

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

The only dismantling that can be carried out is for the removal and replacement of the springs.

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

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

The damper springs are graded at 100 lb./in. rate and have green/pink identification markings.

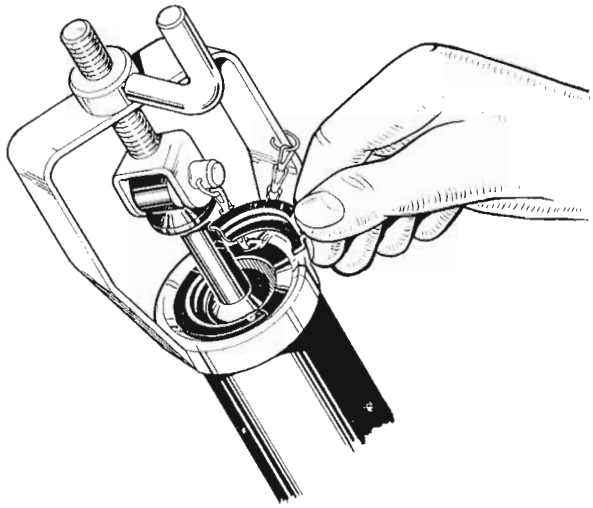

FIG. D.6. *Using tool No.* 61–3503.

If the springs are to be changed, the spring must first be compressed with Service Tool No. 61–3503 to allow the split collets to be removed (see Fig. D.6). After removing the tool, the dust shield can be lifted off, allowing the spring to be taken out. Having renewed the spring and re-fitted the dust cover, the spring will have to be compressed with the Service Tool again to enable the split collets to be inserted.

Do not lubricate the plunger rod or bushes.

The dampers have three load positions, light, medium and heavy (see Fig. D.7) and they must be set in the "light-load" position before dismantling. Use a suitable 'C' spanner to carry out any adjustments.

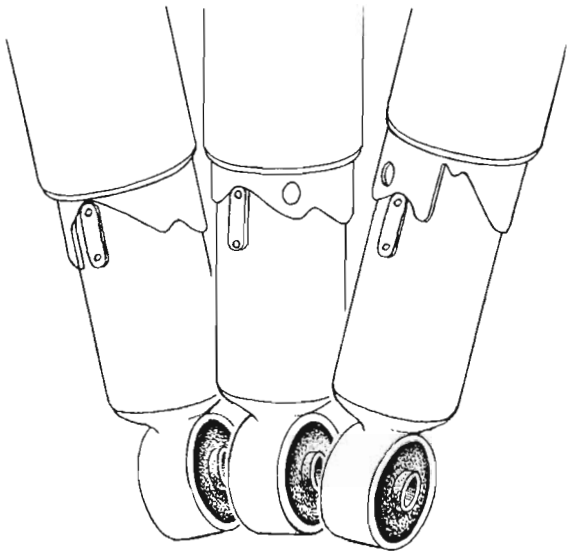


FIG. D.7. *Cam ring positions.*

## SWINGING ARM

**Removal**

Take off the rear wheel, chainguard, dampers and rear brake pedal as described on pages F.7–8 or F.9, D.6, D.6–7, D.10 respectively.

Remove the large nut and lockwasher securing the swinging arm spindle at the right-hand side. After taking out the small spindle flange securing screw, the spindle can be driven out from the right-hand side. Now, using a raw-hide mallet, tap the left-hand side of the swinging arm downwards and the right-hand side upwards to release it from the frame plates.

Replacement is the reversal of the above procedure for removal but, do not tighten the large spindle nut until the dampers have been refitted.

**Bushes**

Each of the two bushes fitted to the swinging arm fork consist of two steel sleeves, bonded together with rubber. The inner sleeve is slightly longer than half the width of the fork in the frame, the two inner sleeves are locked together

on the end faces, so placing the rubber under tension when the fork moves.

Under normal circumstances, the bushes will last the life of the machine, but should they require renewal, the rubber will have to be first removed. This can be done by progressively burning out the rubber with thin rods or strips of metal which have been heated. When sufficient rubber has been burnt away, drive out the inner sleeves, after which the outer sleeves can be removed with a suitable drift.

**Alignment**

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

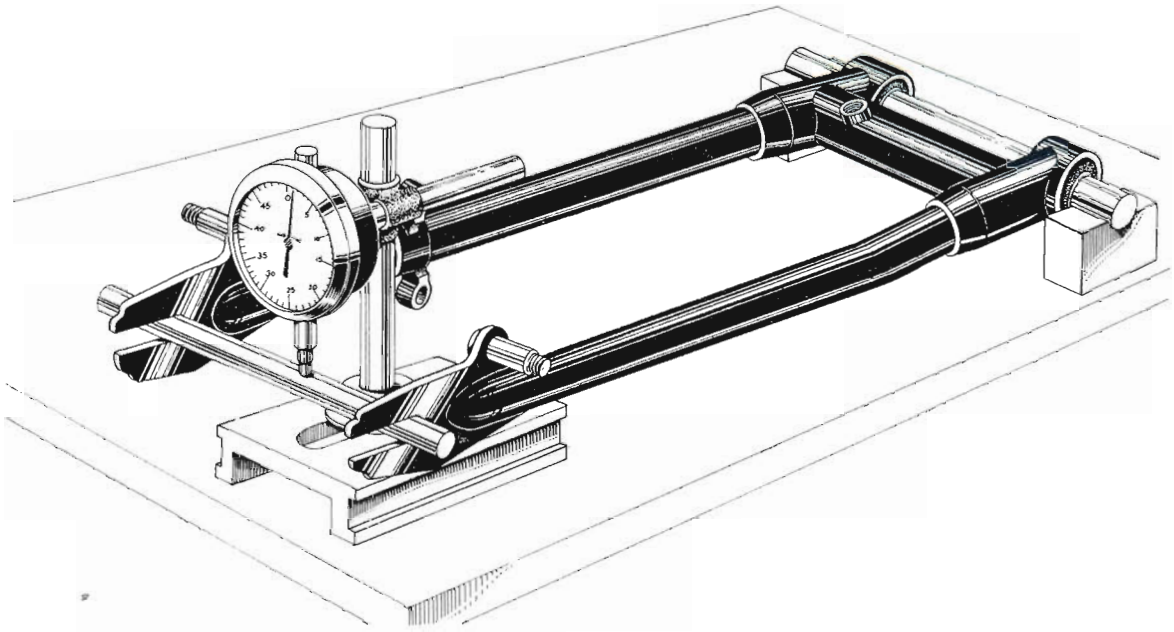

FIG. D.8. *Checking the swinging arm.*

Using the same mandrel that was used for the swinging arm pivot on the frame (see page D.4), set the swinging arm in "V" blocks as shown in Fig. D.8. Another mandrel 9 in. long by ⅝ in. diameter should be inserted through the fork ends. Both mandrels should be parallel to the surface table. Should there be less than ¼" misalignment of the swinging arm fork it is permissible to correct it by means of a suitable lever but, care must be taken to avoid causing further damage.

To check that the forks are square to the pivot, they must be set-up at 90° to the position illustrated, so that the pivot is vertical. Next, find the centre of the pivot and check that the fork ends etc., are in accordance with the dimensions shown in Fig. D.9.

When there is considerable malalignment in either frame or swinging arm, owners in the British Isles can obtain works reconditioned units through the dealer network.

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

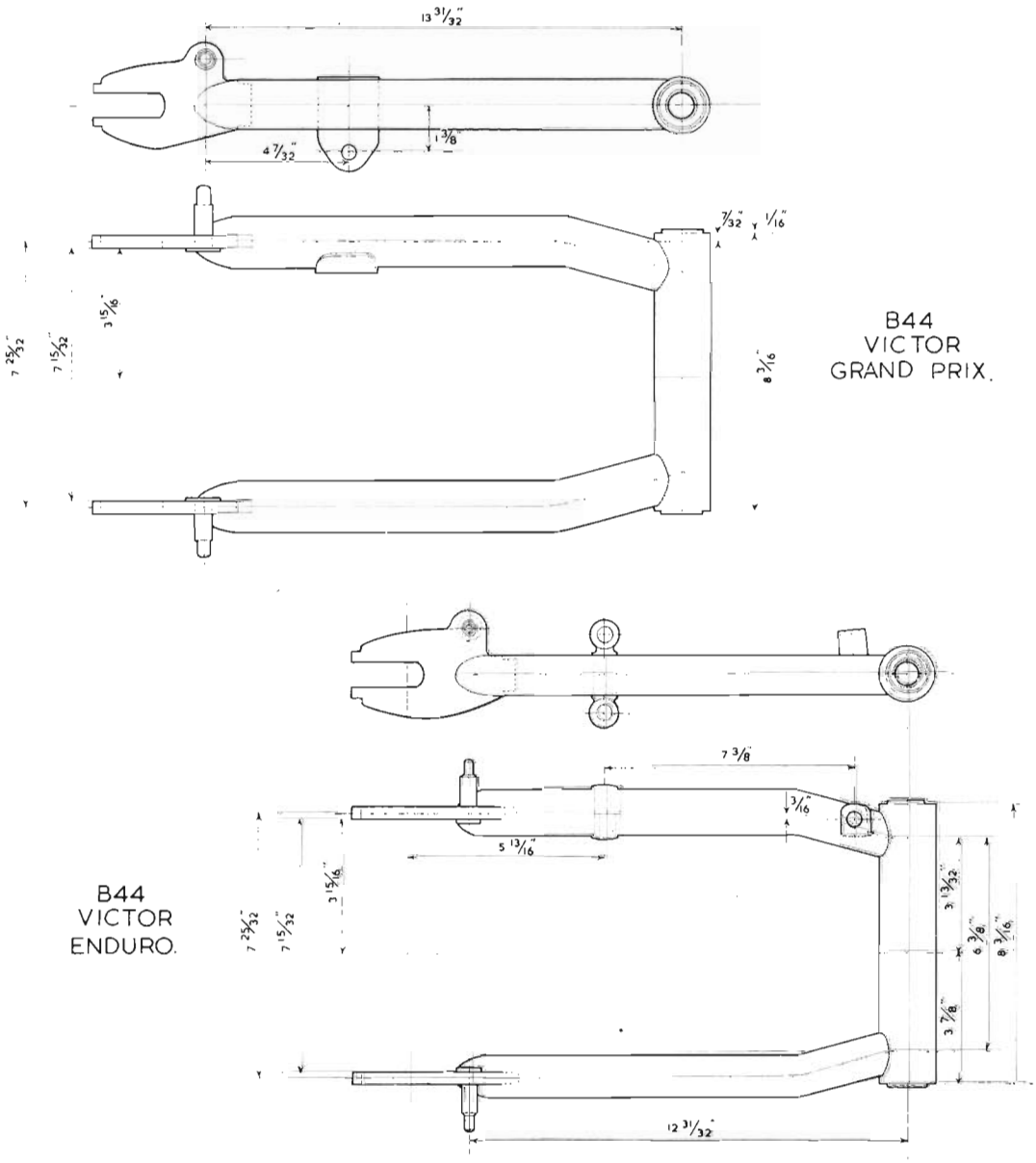


FIG. D.9. *Swinging arm dimensions.*

## SADDLE

The saddle is mounted on a bracket at the rear, which is secured to the frame member by two bolts with nuts and washers. To remove, reach below the saddle and unscrew the nuts and bolts. The saddle can then be withdrawn backwards to disengage its clip from the front mounting rod.

NOTE:—The saddle on the Victor Grand Prix model is secured to the frame cross member by one nut and bolt.

Victor Enduro and Special (U.S.A.) models made on and after frame No. B44EA.101 are fitted with a duel seat which is secured by two nuts at the rear.

Replace in the reverse order, making sure that the clip engages correctly with the front mounting rod (Victor Enduro and Special (U.S.A.) only).

### PROP STAND (Victor Enduro and Special (U.S.A.) models only)

The prop stand is secured to the frame lug with one bolt and lockwasher. Bend back the tabs of the lockwasher and unscrew the bolt. The return spring will be released as the stand is drawn off the frame lug.

### ENERGY TRANSFER COIL

**Victor Enduro and Special (U.S.A.)**
Take off the saddle (see page D.9) and disconnect the sparking plug lead. Unclip the "Lucar" connector at the coil to free the small feed wire. Remove the two nuts and washers, securing the coil to the frame cross member and pull the coil downwards to release.

Before replacing the coil, locate the connector for the twin red wire on to the right-hand fixing bolt (between the coil and frame cross member) and the connector for the thin wire on to the left-hand fixing bolt.

**Victor Special (1968)**
The coil is positioned beneath the tank on the 1968 Victor Specials, and is secured by a single nut and bolt. Take a careful note of the terminal location of each cable.

To replace the coil proceed in the reverse order as removal.

**Victor Grand Prix**
The coil is secured to the rear right-hand frame down tube by two nuts and bolts.

Remove as described above but, when replacing, do not omit to locate the cable connectors on to the lower fixing bolt.

### REAR BRAKE PEDAL

Take out one screw and nut (spring pin on 1968 models) securing the brake rod to the brake pedal. Remove the central fixing bolt with large plain washer from the fulcrum pin and take off the pedal with return spring. The fulcrum pin is fixed to the frame with one large nut and washer.

NOTE:—On Victor Grand Prix machine, the brake pedal fulcrum pin is held in place with one nut and washer and is removed with the pedal.

### REAR MUDGUARD

It will not be necessary to remove the rear wheel, but on Victor Enduro and Special (U.S.A.) models the saddle may have to be taken off to provide access to the tail lamp cable connection. The tail lamp is secured by two bolts with nuts from the top (also holding the number plate bracket), and one nut from below the guard. When these are released, the cable at the lamp and at the connectors below the energy transfer coil can be disconnected, enabling the tail lamp to be withdrawn.

After taking out the six fixing bolts with nuts and washers, the mudguard can be pulled gently away from the rear.

The short aluminium mudguard on the Victor Grand Prix is retained in position by four bolts with nuts and large washers.

Replace in the reverse order but on Victor Enduro and Special (U.S.A.) models, ensure that the tail lamp connectors are in good order and that the cable is not "bared" at any point.

### CARBURETTER AIR FILTER

**Victor Enduro and Special (U.S.A.)**—If the machine is being used regularly for competition work or under exceptionally severe conditions, the air filter should be cleaned at intervals of not more than one week and preferably before every event.

First undo the three locknuts with washers holding the triangular fibreglass cover at the left-hand side of the machine. On removal of the cover, it will be seen that the air filter element is located loosely over the housing mouth.

Wash the element in petrol and dry thoroughly before replacing.

The air filter housing is secured to the frame by two studs with "Nyloc" nuts at the top and by one nut and bolt at the front. If the housing is to be removed, make a careful note of the position of each spacer.

Before finally refitting the triangular cover, do not omit to replace the long spacer tubes over the studs.

The air cleaner on the 1968 Victor Special is screwed on to the carburetter inlet mouth and is sealed by a rubber "O" ring. If this "O" ring is damaged then a new one should be fitted. To remove the element, unscrew the single screw on the outside perforated band, and remove air cleaner element. It is of the dry surgical gauze type and therefore can be washed in clean petrol and allowed to dry.

**Victor Grand Prix**—The carburetter draws filtered air from two highly efficient filters (one each side of the machine) via a centrally disposed housing beneath the saddle. Obviously to ensure maximum efficiency from the air filter, the elements must be cleaned before every event.

The filters are accessible, following removal of their fibreglass outer covers (retained by snap connectors) and can be taken off when the central fixing screws are released (see Fig. D.10).

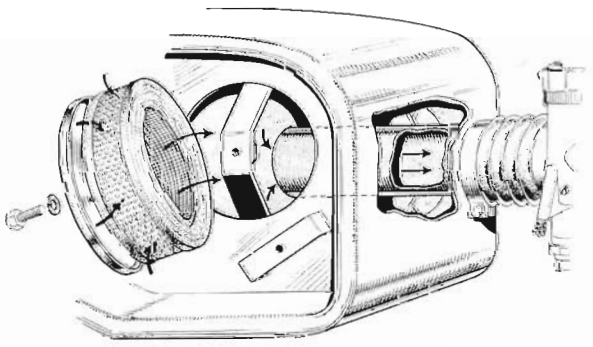

FIG. D.10.

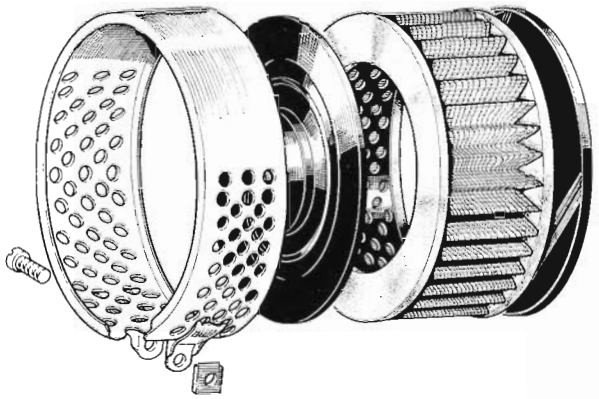

FIG. D.10A. *Air cleaner* (*Victor Special* 1968).

The filters are composed of paper elements and should be replaced in their entirety when choked.

Check that the soft rubber facings are in good condition to ensure an air-tight joint.

The filter housing is secured to the top frame cross member by two bolts with spacers, and to the front fixing strap by one bolt. The fixing strap is held to the frame tubes by two nuts and bolts. To remove the housing first take off the saddle, disconnect the carburetter adaptor clip and release the fixing bolts.

### OIL TANK REMOVAL (Victor Enduro and Special (U.S.A.) models only)

Take out the drain plug and drain the oil from the tank. Remove the saddle (page D.9) and take off the energy transfer coil to avoid damage.

Loosen the small oil pipe clips at the tank and disconnect the rocker box oil feed pipe and the main oil feed and return pipes (noting cross-over of pipes).

The oil tank is secured to the frame cross member, at the top rear, by a single rubber-mounted bolt (see Fig. D.11). Three rubber buffers support the tank at the front, one at the top and two at the base.

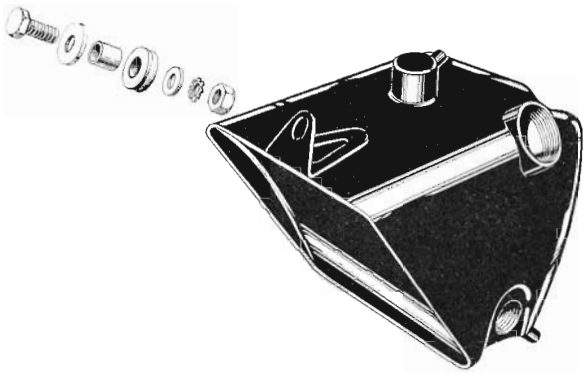

FIG. D.11. *Oil tank mounting.*

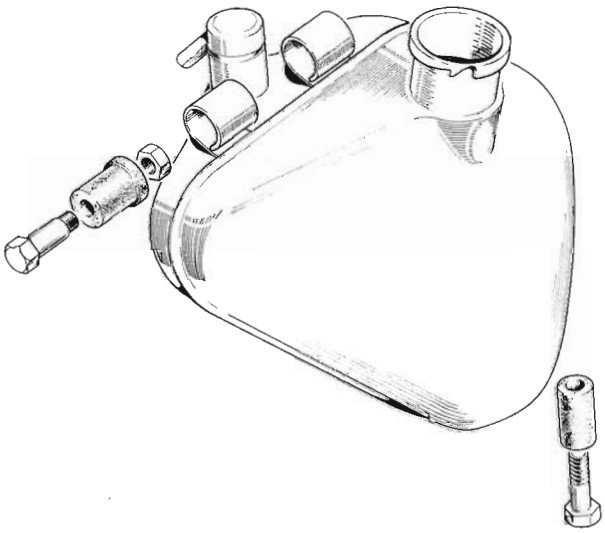

FIG. D.11A. *Oil tank* (1968).

Before attempting to remove the oil tank, it will be necessary to lower the rear mudguard on to the wheel, to provide sufficient clearance for the withdrawal of the tank.

First, pull out the tank rubber buffers and remove the two fixing bolts with large washers and nuts, securing the mudguard front to the lower frame bracket. Also take out the two bolts with nuts and washers, holding the mudguard top to the rear of the frame support rail. Now, slip the front edge of the mudguard behind the swinging arm pivot and push the guard gently downwards on to the top front of the rear wheel.

After releasing the oil tank from the top frame member, the tank can be lowered and withdrawn from the right-hand side of the frame.

Replacement of the tank is a reversal of the above instructions but, after replacing the oil pipes, check that there is no oil leakage. The rubber buffers that support the tank are simply a press-fit into the frame brackets. If they have become saturated with oil, it is advisable to renew them.

On models for 1968 a new oil tank is fitted, and to remove, the following instructions should be observed. First, unscrew the tank filter plug and drain the oil into a suitable receptacle, then remove the seat as described on page D.9. Undo the small fixing clip and detach the oil return pipe from the crankcase union. The rocker oil feed pipe need not be disturbed.

Two long bolts with nuts secure the tank mounting clips to the dual seat support rail. Each clip is fitted with a rubber sleeve which should be left in place, unless in need of renewal.

The tank is located at its base by a bolt which passes through a rubber grommet, mounted in a frame bracket, into the tank, the tank can now be removed.

Replacement of the tank is the reverse of removal.

### SPEEDOMETER HEAD (Victor Enduro and Special (U.S.A.) models only)

**Removal**

Pull out the bulb holder with bulb and cable from the base of the speedometer head and pull out the trip recorder set pin (push-fit). Unscrew the knurled ferrule and withdraw the speedometer drive cable.

Now, using a screwdriver blade under the chrome bezel, gently prise the speedometer head out of the cup. This operation will be found much easier if a little liquid soap is applied between the inside of the rubber mounting ring and the head. Having extracted the speedometer head, disconnect the earth lead to free completely.

The speedometer cup is secured to the top yoke by two bolts with distance pieces.

**Replacement**
Ensure that the bottom edge of the rubber mounting ring is correctly located under the top return edge of the cup. Re-connect the earth lead to the speedometer head.

To ease reassembly, lubricate the inside of the rubber mounting ring and the outside of the speedometer head with liquid soap, taking care not to allow soap into the holes in the head base.

Check that the instrument dial is the right way round and push the head firmly into the cup, pulling the top edge of the mounting ring over the chrome bezel.

Replace the bulb holder with bulb and cable, and insert the trip recorder set pin.

Finally, reconnect the speedometer drive cable and tighten the knurled ferrule.

## CONTROL CABLE REPLACEMENT

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

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

Remove the petrol tank as described on page B.13.

Detach the cable from the frame clips and unscrew the knurled ring holding the mixing chamber on to the carburetter. Very carefully draw out the throttle slide assembly.

Taking careful note of its position, remove the throttle needle clip and withdraw the needle.

Compress the throttle slide return spring then push the cable nipple down and out of the location in the slide (see Fig. D.12).

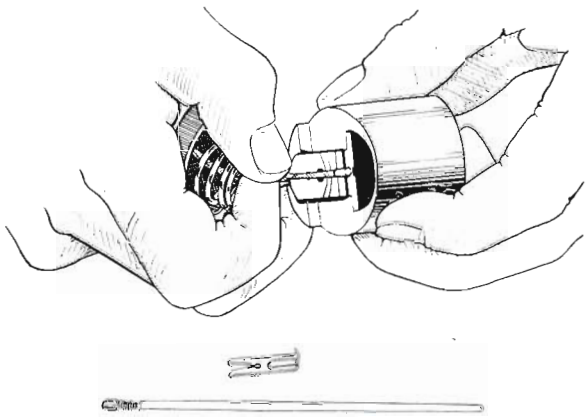

FIG. D.12.

To fit the replacement cable, pass the nipple through the top cap and spring, compress the spring and insert the cable through the slot in the slide so that the nipple is seated to one side of the central hole.

Replace the throttle needle and secure with the spring clip in the correct needle groove (see page GD.4). Locate the throttle slide in the carburetter body and ensure that the needle enters the needle jet. Check that the throttle slide assembly moves freely in the body and replace the top cap with knurled ring.

Make absolutely sure that the peg in the top cap is located with the cut-out in the carburetter body before screwing down the ring.

Check that the controls operate correctly and smoothly.

Attach the cable to the frame, replace the cable stop at the twist grip and adjust the cable as necessary (see page C.6).

### THROTTLE CABLE
**(Carburetter with concentric float chamber)**

The cable must first be replaced at the twist grip control as detailed for the standard carburetter on page D.13.

Proceed by removing the petrol tank (see page B.13) and detaching the cable from the frame clips.

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

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

Finally, attach the cable to the frame, replace the cable stop at the twist grip and adjust the cable as necessary (see page C.6).

**Front Brake Cable**
To remove the front brake cable, first completely loosen the cable adjusters and unscrew the nut and bolt holding the toggle to the lever on the brake cover plate. Now, pull the cable adjuster away from the handlebar lever bracket and slip the cable nipple out of the lever.

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

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

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

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

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

**Exhaust Valve Lifter Cable**
Undo the handlebar control lever pivot bolt and nut. Pull the lever away from the bracket and disconnect the cable nipple.

Now, working from the right-hand side of the machine, pull the cable outer cover out of its location in the valve lifter lever and raise the cable to release (see Fig. D.13). Screw out the cable adjuster from the bracket and withdraw the cable complete with adjuster and spring.

After replacing the cable, use the cable adjuster and locknut on the bracket to obtain the correct setting. Ensure that there is ample slack in the cable to allow the exhaust valve to close properly whilst running.

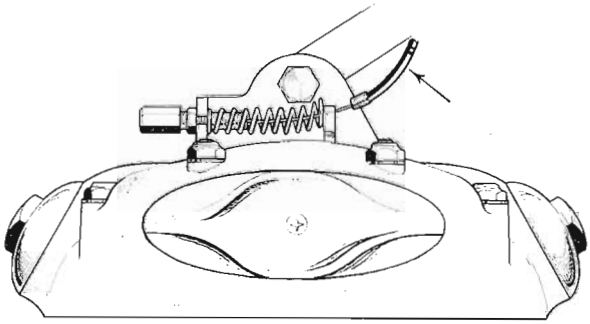

FIG. D.13.

## TOOLBOX AND BATTERY CARRIER
### (1968 Victor Special)

For 1968 the Victor Special has been fitted with a battery carrier and toolbox. This is positioned on the left-hand side of the machine, the following paragraphs give instruction on removing and replacement. Access is gained to the battery carrier and toolbox by removing the sidecover. This is retained by two "Oddie" studs which require only half a turn to release.

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

Proceed by removing the rubber mat from the carrier base to expose the three fixing bolts. The two outer bolts are each fitted with two rubber bushes, two plain washers and a nut.

A third nut retains the sidecover buffer bracket on to the end of the front bolt. The inner fixing point consists of one long bolt, three rubber bushes, a spacer tube, four plain washers and a nut.

The rubber bushes help to insulate the battery and carrier from road shocks and vibration. It is most important, therefore, that a note is made of the way in which they are fitted in order to ensure correct reassembly.

**Toolbox Removal**
To remove the toolbox, first take out the tool roll then release the two fixing bolts and nuts. The lower bolt is fitted with a spacer between the toolbox base aud the frame bracket. Gently pull away the toolbox and noting their terminal locations, disconnect the rectifier cables, allowing the assembly to be withdrawn from the frame.

The rectifier is held to the toolbox by a single nut and should not be disturbed unnecessarily. When either unscrewing or tightening the fixing nut, the bolt head should be held firmly with a second spanner to prevent it from turning. If this precaution is not taken, the rectifier plates may twist and break the internal connections.

**Reassembly**
Reassembly is the reverse of removal.

## INDEX

### DESCRIPTION

The front forks fitted to the Victor series of models are basically the same, the only variation being in the outer sleeves. They are both telescopic and are hydraulically damped, the oil for which also lubricates the internal components.

The forks are of robust design and therefore require the minimum of maintenance, apart from the periodical oil changes as detailed on page A.14.

### REMOVING AND REFITTING THE HEADLAMP
**(Enduro and Special (U.S.A.) models only)**

Should it be necessary to remove the front forks or steering head, the headlamp must first be taken off.

Pull out the bulb holder with bulb and cable from base of speedometer head and disconnect the three headlamp cables from the multi-connector on the frame (below petrol tank). The cable harness can now be freed from the rubber clips.

Take out the two headlamp fixing bolts with washers and spacers, and lift the headlamp, complete with cables, away from the fork brackets.

Refitting the headlamp is simply a reversal of the above procedure but it must then be reset to give the correct beam, as described on page G.23.

### ADJUSTING STEERING HEAD RACES

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

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

Care is necessary to distinguish between play in the head races and play in the fork bushes.

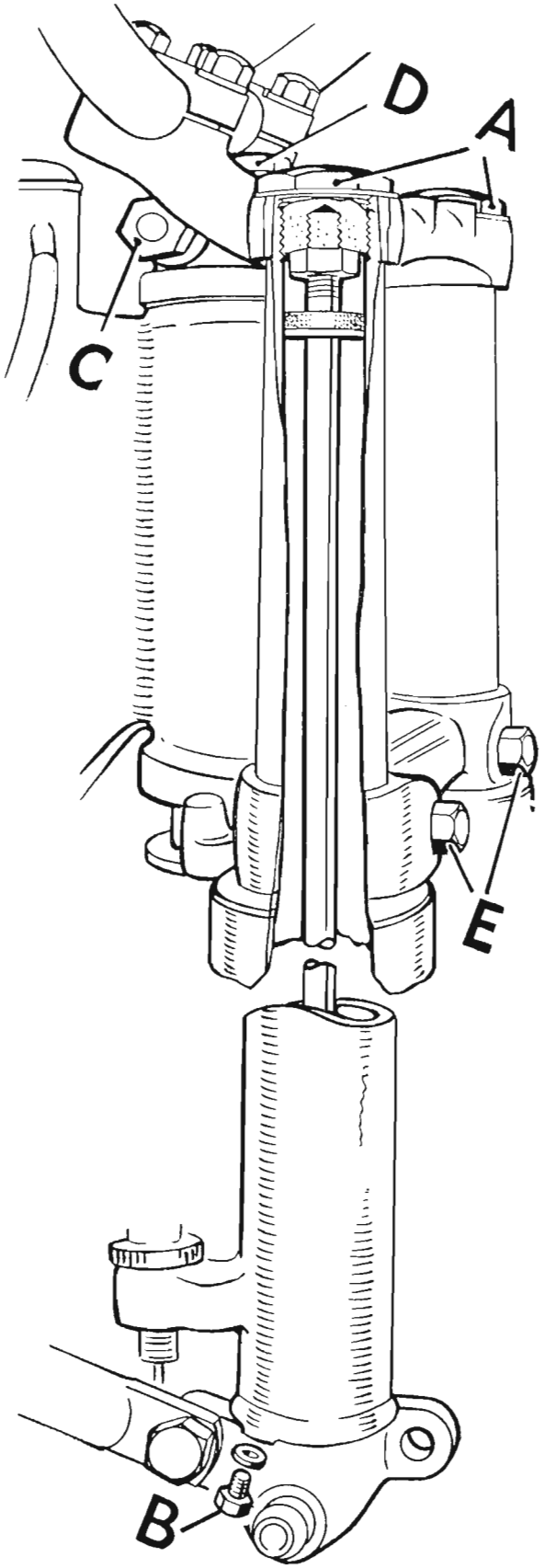


FIG. E.1.

In some cases there may be both.

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

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

To adjust the steering head assembly, slacken the clamp nuts (C) and (E) Fig. E.1, then tighten down the adjuster nut (D) until adjustment is correct. There should be no play evident in the races but great care must be taken not to over-tighten, or the ball bearings will become indented into the races, making steering extremely difficult and dangerous.

Having carried out the adjustment, tighten the clamp nuts (C) and (E) securely. Recheck the adjustment.

### RENEWING HEAD RACES

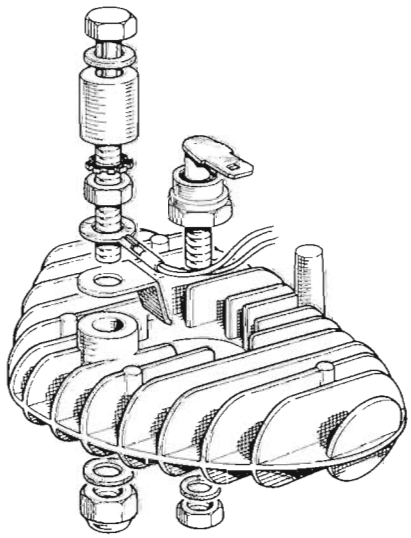

FIG. E.1A. *Zener Diode* (1968).

The steering head can be dismantled to change the races without stripping the forks, but on Enduro and Special (U.S.A.) models only, it is advisable to remove the headlamp and the speedometer (see pages E.2 and D.12) to avoid damage. On 1968 models there is a Zener Diode fitted under the bottom fork yoke, this should also be removed (see Fig. E.1A).

Also disconnect the front brake cable at the handlebar lever.

Protect the fuel tank with a piece of cloth, take out the four bolts securing the handlebar clips and place the handlebar on the tank.

Slacken the pinch bolts (C) and (E) and take off the adjuster nut (D). Unscrew and pull upwards, the fork caps (A). To release from the internal damper rod, loosen the locknut beneath the cap and unscrew from the rod.

Then, using a raw-hide mallet, strike the under sides of the top yoke alternately to release from the tapered legs. Place the top yoke to one side and draw the steering stem down and out of the head, taking care not to lose the bearings, which will be released as the stem is withdrawn. There should be twenty ¼ in. diameter steel balls in each race (see page A.14 for details on lubrication).

The two bearing cones differ slightly in size but the cups are identical.

The lower cone can be prised off the column but, when fitting the replacement, care must be taken to see that the cone is seated squarely. For this purpose a length of heavy gauge steel tubing, long enough to clear the column and 1¼ in. in diameter is most useful for driving the cone on to its seating.

The cups can be removed with the aid of Service Tool No. 61–3063. Slacken off the nut on the tool sufficient to allow the tool to be screwed into the cup, then tighten the nut until the tool is expanded tightly into the cup threads. Drive out the cup with a suitable bar from inside the head tube (as shown in Fig. E.2).

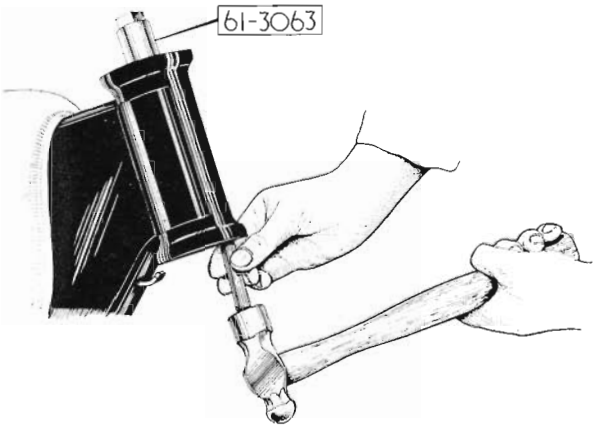


FIG. E.2. *Removing the top cup.*

Remove the tool by loosening the nut and repeat the procedure for the other cup.

When fitting replacement cups, see that they enter their housings squarely. Do not drive the cup in with a drift against the radius of the ball race as this will impose undue strain and is liable to fracture the cup. If possible, use a piece of steel bar or tube having a diameter slightly less than that of the cup sides. A suitable drift would be as shown in Fig. E.3.

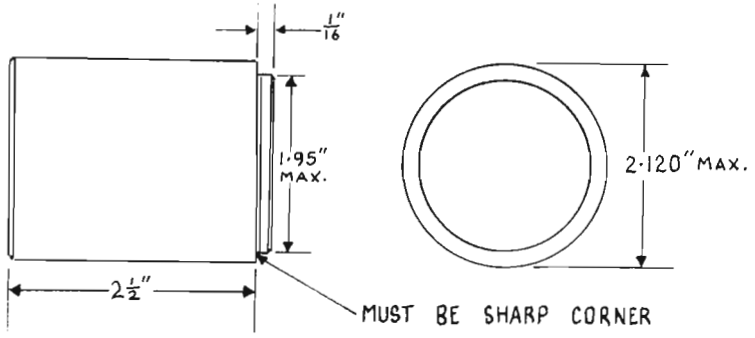


FIG E.3. *Cup drift.*

After replacing the cups and bottom cone, grease the cups and assemble 20 balls into each cup. Slide the column back into the head, replace the top cone and dust cover then fit the top yoke. Screw on the adjuster cap and adjust the steering as quoted on page E.2.

Reassembly from this point is simply a reversal of the dismantling procedure.

## REMOVING THE FORK LEGS

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

(a) 65–5451 Oil Seal (2)
(b) 65–5424 Top Bush (2)
(c) 41–5137 Lower Bush (2)
(d) 41–5144 Damper Rod Bush (2)
(e) 61–3350 Service Tool
(f) 61–3005 Service Tool
(g) 61–3006 Service Tool
(h) 61–3007 Service Tool
(i) 61–3765 Service Tool

and a length of No. 5 twine, approximately 15 in. long

Remove the front wheel as described on pages F.2–3, then take off the front mudguard. Drain the oil from each fork leg (see page A.14) and slacken off the pinch bolts in the bottom yoke.

Unscrew the fork leg cap and raise it sufficiently to enable the damper rod locknut (beneath the cap) to be loosened. The cap can then be

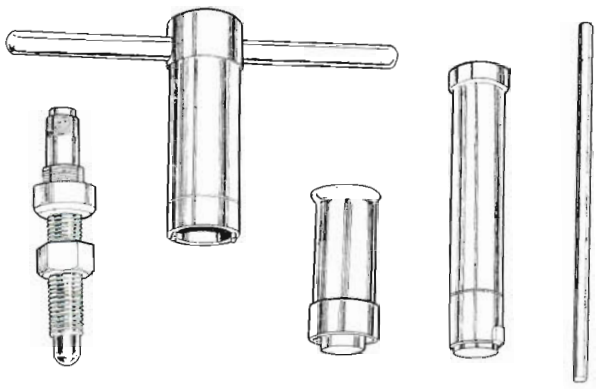

FIG. E.4. *Fork tools.*

unscrewed from the damper rod top. Screw Service Tool No. 61-3350 (minus the large nut and washer) into the top of the fork leg, take a firm grasp of the lower sliding member and strike the top of the service tool sharply with a mallet. This will release the leg from its taper fit in the top yoke, allowing the complete leg to be withdrawn.

On Victor Grand Prix models, the aluminium fork spring cover with rubber washers can now be lifted away.

The spring cover on Enduro and Special (U.S.A.) models is secured to the bottom yoke by the pinch bolts and need not be disturbed.

On 1968 models there are rubber spring covers these should be checked and if damaged they should be replaced.

The fork springs can now be pulled out of the oil seal holder and checked for wear. If replacemen springs are required, smear them with grease before fitting.

## DISMANTLING THE FORK LEG

To assist in dismantling, hold the fork leg firmly in a soft-jawed vice at its wheel spindle lug. Slide Service Tool No. 61-3005 over the main tube and engage the dogs with the slots at the base of the oil seal holder.

Whilst pressing down firmly on the tool, turn anti-clockwise to unscrew the holder.

Remove the tool and slide the holder upwards until it locks on the tapered section of the tube, but do not use force or the oil seal may be damaged.

The main tube assembly can now be withdrawn from the lower sliding member.

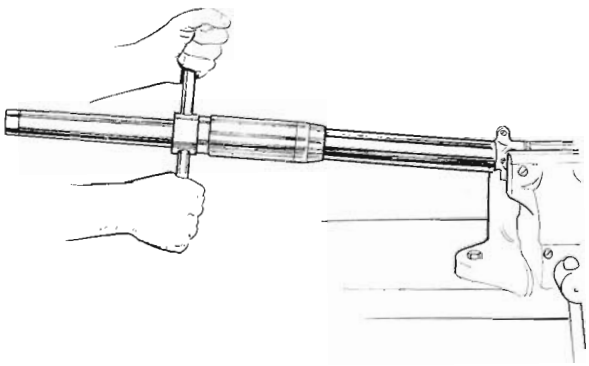

FIG. E.5. *Removing oil seal holder.*

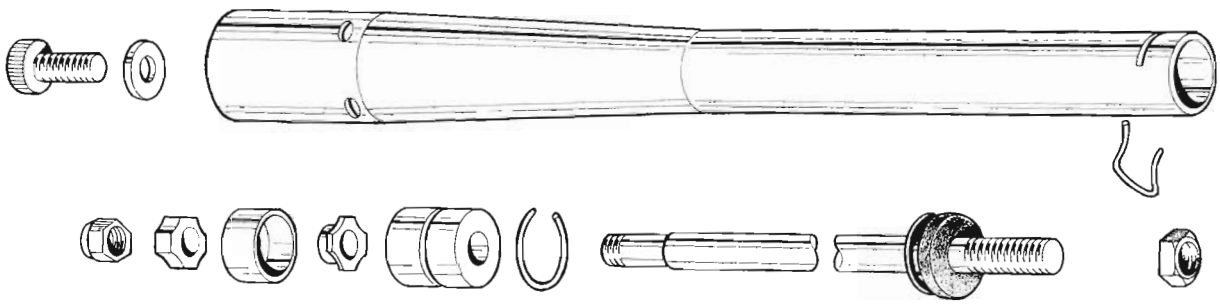

FIG. E.6.

Grip the unground portion of the tube in a vice, using soft clamps, and unscrew the large nut at the base of the shaft, enabling the bushes, spacer and oil seal assembly to be withdrawn.

The damper tube is retained in the lower sliding member at its base by one large "Allen" screw.

After removing the "Allen" screw, take out the two circlips at the damper tube top releasing the damper rod with valve and bush.

The damper valve assembly is secured to the damper rod by one nut (see Fig. E.6 for correct assembly).

The rubber sealing washer and special retainer, immediately below the damper rod top locknut need not be disturbed unless they require renewal.

### OIL SEALS

If it is necessary to change an oil seal, place the lower edge of the holder on a wooden block and insert Service Tool No. 61–3006 into the top of the holder. Give the tool a sharp blow with a hammer and the seal will be driven out.

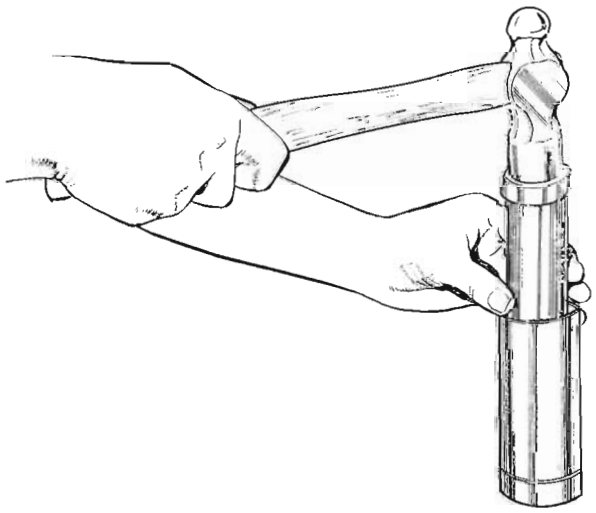

FIG. E.7. *Removing oil seal.*

To fit a replacement seal, coat the outside with a good jointing compound and, whilst still wet, enter the seal squarely into the holder with the open side upwards. Drive the seal home with Service Tool No. 61–3007.

Care must be taken to avoid damaging the feather edge of the oil seal and this should be greased before reassembly.

### REBUILDING THE FORK LEG

Reassembly is carried out in the reverse order to the dismantling procedure. Cleanliness is essential and before attempting to reassemble, clean

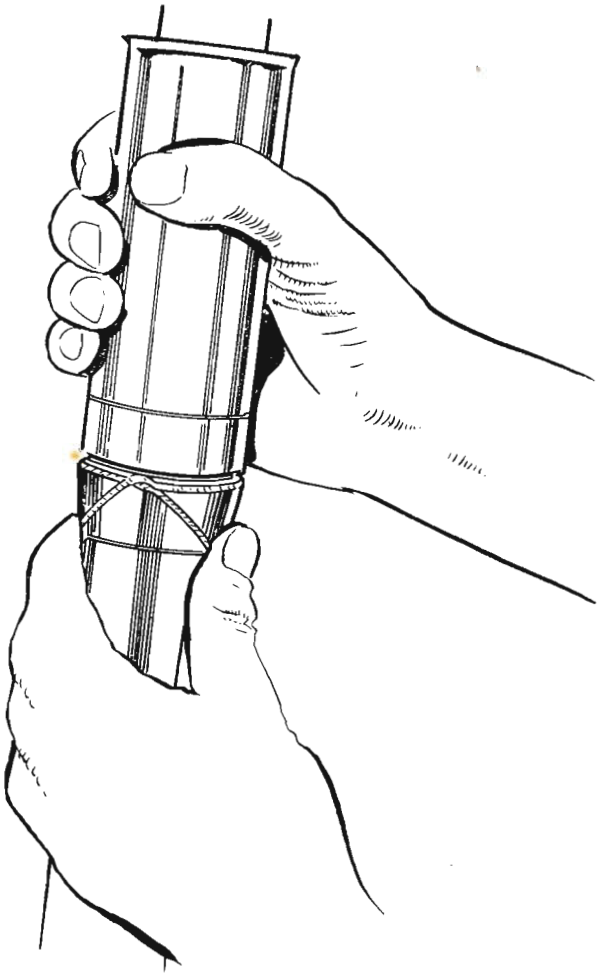

FIG. E.8. *Using the twine.*

all the components thoroughly. It is advisable to also clean the workbench on which the forks will be rebuilt.

NOTE:—During final assembly, screw down the oil seal holder on to one turn of twine round the groove at the end of the screw thread (see Fig. E.8). This will provide an additional oil seal

## REPLACING THE FORK LEG

Screw Service Tool No. 61-3350 (minus the nut and collar) into the top of the fork leg and pass the assembly up through the two yokes. Fit the collar and nut, and tighten the latter until the leg is drawn firmly home into its taper. Tighten the pinch bolts in the bottom yoke before removing the tool. The top nuts and pinch bolts should be tightened to torque wrench settings on page H.1.

Using Service Tool No. 61-3765, raise the damper rod to the top of the tube to enable the cap nut to be screwed on to the rod.

Ensure that the rubber sealing washer and special retainer are correctly fitted directly below the damper rod locknut.

Repeat the operations on the other fork leg, refill with the correct amount of oil (⅓ pint to each leg) and screw down the cap nuts firmly to torque wrench setting on page H.1.

Final assembly is of course, simply a reversal of the procedure for dismantling

## FORK ALIGNMENT

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

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

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

The tubes can only be accurately checked for straightness with special equipment such as knife-edged rollers and dial gauges. Special gauges are also required to check the yokes. It is possible, however, to make a reasonable check of the tubes by rolling them on a good flat surface such as a piece of plate glass, but it is not a simple operation to straighten a bent tube. It is far better to obtain a factory serviced unit if the owner is resident in the British Isles.

If the tube is obviously bent but not kinked, then it may be possible to carry out a reasonable repair with a little patience and care. Find the highest point on the bend, then with wooden blocks supporting each end, give the tube a sharp blow with a soft mallet and recheck. If a hammer is to be used, remember to protect the tube with a piece of wood. The measure of success will of course depend on the extent of the damage and the skill of the operator.

This job is vastly improved upon and simplified if a suitable press is available to the repairer. The damper rods and tubes should now be checked in a similar manner

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

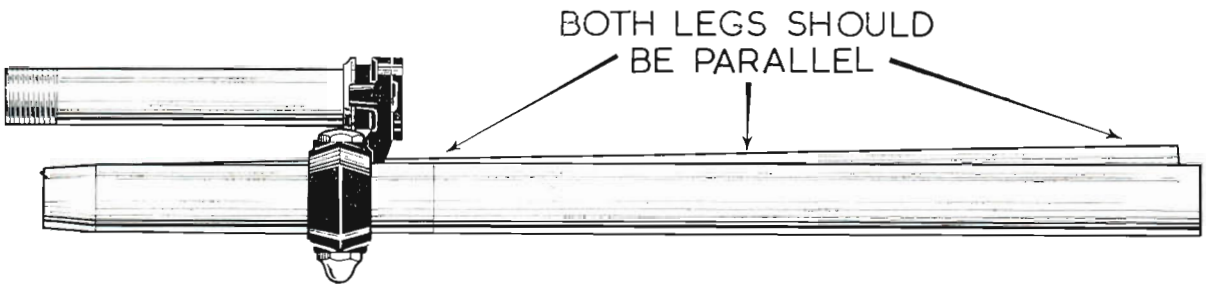


FIG. E.9. *Bottom yoke twisted.*

If the tubes are not parallel, as in Fig. E.9, then it will be necessary to reset the yoke, providing the error is not excessive.

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

The next step is to place the top yoke in position over the tubes, when the steering column should be quite central. Figure E.10 shows a bent steering column.

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

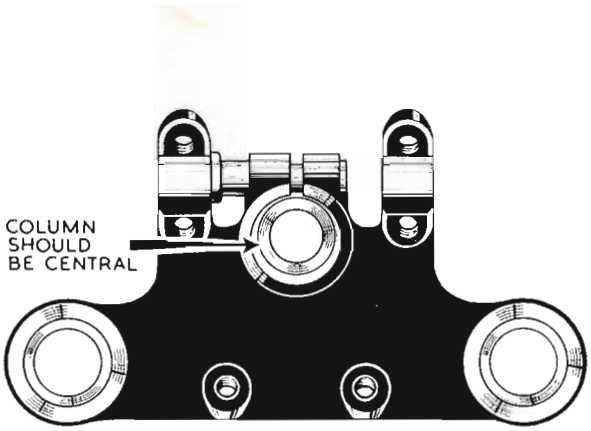


FIG. E.10. *Bent steering column.*

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

### HYDRAULIC DAMPING

Figure E.11 shows a sectional view of a front fork leg extended.

Note the four 3/32 in. diameter bleed holes in the main tube and the transfer holes at the base of the damper tube.

When the forks are compressed, a double damping action takes place within each fork leg. As the fork leg rises, oil in the damper tube is compressed by the valve and is forced through the transfer holes, into the main tube. At the same time, the oil in the main tube is also being compressed and is forced upwards between the outside of the damper tube and the top tube bush. The pressure of the oil increases as the gap narrows around the tapered damper tube, progressively slowing the fork spring action.

When the top tube begins to fill with oil which can no longer be compressed, the oil passes through the bleed holes and into the area between the fork leg and top tube bushes. Eventually the point of maximum compression is reached and is cushioned by the remaining oil in the main reservoir.

As the fork leg begins to extend again, the oil in the area between the two fork bushes is compressed and forced through the four bleed holes, back into the main tube.

The damper valve, as it rises, creates a vacuum and draws oil into the damper tube, via the transfer holes, thus providing a smooth cushioned motion.

It will be seen therefore, that each leg should contain the same amount of oil (⅓ pint) to provide uniform damping.

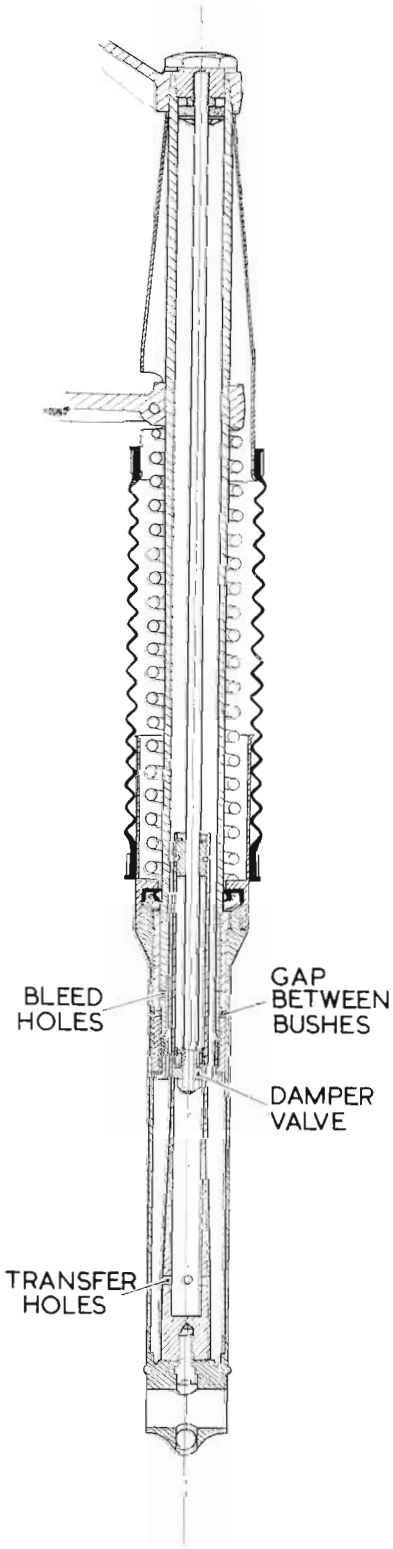


FIG. E.11.

## INDEX

## FRONT WHEEL

**Front Wheel Removal**

First, place a box or small wooden trestle underneath the crankcase to raise the front wheel clear of the ground.

Screw in the brake adjuster completely and disconnect the front brake cable by unscrewing the nut and bolt holding the toggle to the brake plate lever.

Having released the cable toggle, unscrew and remove the cable adjuster with cable (see Fig. 1b).

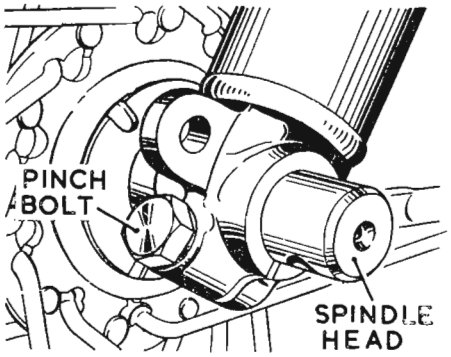


FIG. F.1a.

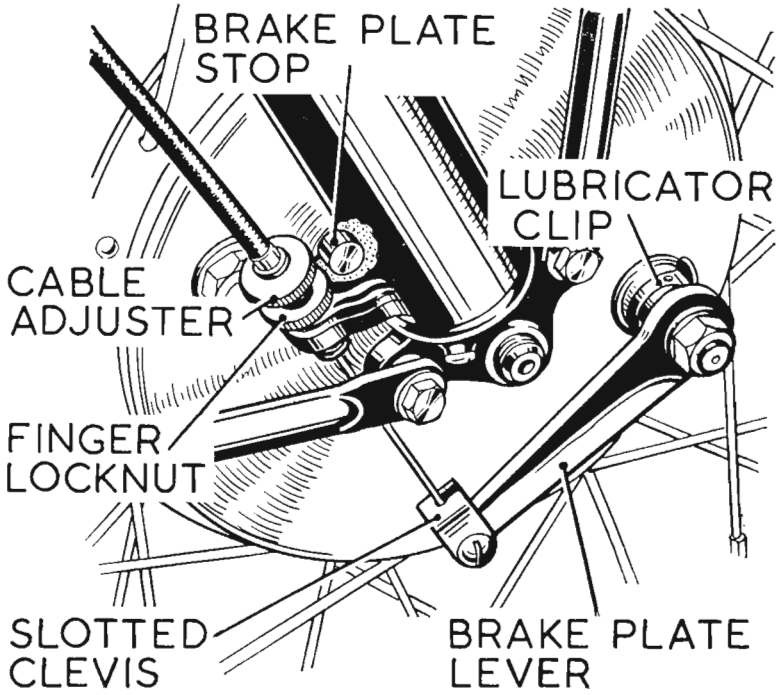


FIG. F.1b.

Slacken off the pinch bolt at the bottom of the left-hand fork leg, insert a stout tommy-bar through the hole in the wheel spindle head and unscrew it from the hub. Note that the spindle has a left-hand thread and unscrews by turning in a clockwise direction.

Support the wheel as the spindle is withdrawn and when free, the wheel can be pulled away from the right-hand fork leg and withdrawn from the machine.

Do not allow the wheel to fall on to the bush which projects from the brake drum side of the hub. Although the bush is firmly pressed in, it may, if subjected to a sharp blow, be forced into the hub.

Should this occur, however, the bush can be retrieved and re-positioned with the aid of the wheel spindle.

**Front Wheel Replacement**

Insert the wheel between the fork legs and screw in the spindle in an anti-clockwise direction, until it is almost tight. Locate the brake plate anchor peg in the recess on the inside of the right-hand fork leg and tighten the wheel spindle fully.

Before locking the spindle with the pinch bolt, depress the forks once or twice to enable the left-hand fork end to position itself on the spindle. If this precaution is not observed, the fork leg may be clipped out of position and will not function correctly.

Finally, tighten the pinch bolt and reconnect the brake cable. For details on brake adjustments see page F.11.

**Front Brake Cam**

On Victor Enduro and Special (U.S.A.) models, lubrication of the cam spindle is made via an oil hole in the cam boss (see inset Fig. F.3). Move aside the spring clip to expose the hole and apply just sufficient oil to ensure that the cam can be operated easily.

On Victor Grand Prix models, a detachable brake cam housing is provided (see inset Fig. F.2). It is designed to give lateral movement, thus allowing the brake shoes to be automatically

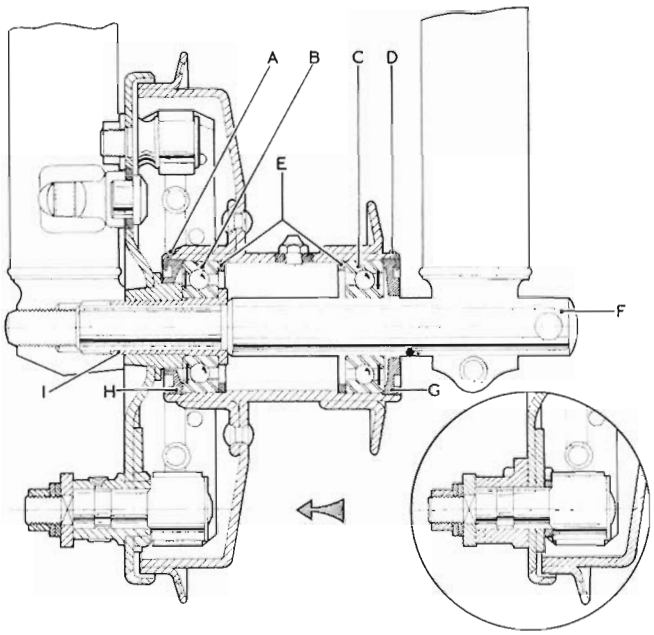


FIG. F.2. *Section of front hub.*

centralised and to provide a limited degree of servo-action. The housing must always be free to move but should be checked frequently to ensure that there is no excessive freedom. The cam boss is fitted with a grease nipple to enable the cam to be lubricated.

Care must be taken to avoid over-lubricating the cam; oil or grease must not get on the brake linings.

**Front Brake Shoes**

The brake plate is a push-fit on the bush (1) see Fig. F.2. The brake shoes can be removed by levering them outwards and upwards off the cam and fulcrum pin. The springs are very strong; take care not to trap the fingers behind the shoes.

The brake shoes are of the conventional type (not floating) and can be fitted either side.

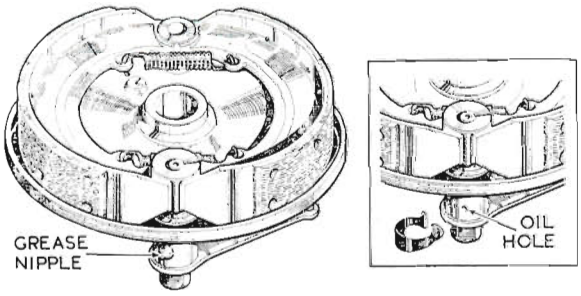


FIG. F.3.

A hole is provided in the base of the brake plate to enable any water in the drum to drain away quickly. Check that it is not blocked with dirt or mud.

If the brake linings require replacement, advantage can be taken of the B.S.A. Exchange Replacement Service, when complete relined shoes can be obtained in exchange for the old ones at a moderate cost.

This scheme applies to the British Isles only; for those who cannot make use of this service, the notes on relining (page F.12) may be of some assistance.

**Checking Front Wheel Bearings**

Pull off the brake cover plate and remove the split pins at each side of the hub (see Fig. F.4). Unscrew the bearing retainers (which have normal right-hand threads).

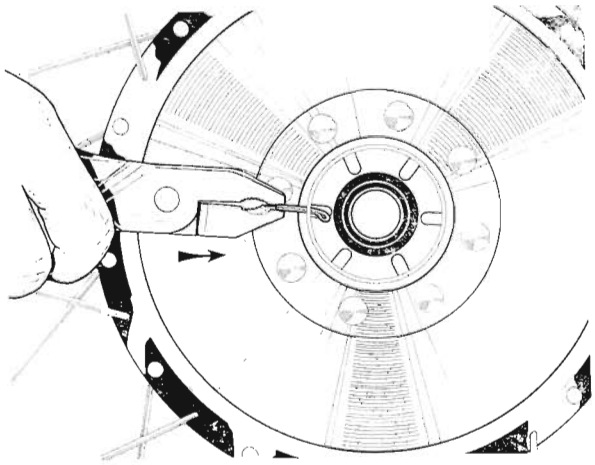

FIG. F.4. *Removing split-pin.*

Replace the wheel spindle and drive out the brake side bearing together with the bush (1) by gently tapping the spindle head with a hide-mallet. If a suitable mallet is not available, protect the spindle head with a piece of hard-wood before striking.

By inserting the spindle and bush from the right-hand side, it will be possible to drive out the left-hand bearing. Both bearings are the same size and are therefore interchangeable.

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

**Fitting New Bearings**

Ensure that the steel thrust washers (E) are correctly located in the hub shell and fit the right-hand bearing with the oil seal outwards. It is essential that the bearings are pressed in absolutely square to the housing and the force applied must be on the outer ring, not on the inner ring.

Screw in the bearing retainer and secure with the split pin.

Insert the bush (1) and then the wheel spindle (threaded end first) into the bearing from the left-hand side and tap the spindle gently home until the shoulder of the bush rests on the inner ring of the bearing.

Apply a liberal coating of grease on to the inner face of each bearing. Place the left-hand bearing over the spindle (with oil seal outwards) and drive it into the housing. Finally, replace the bearing retainer and split pin.

## FRONT WHEEL REMOVAL AND REPLACEMENT (1968 Victor Special)

To remove the front wheel, first disconnect the cable from the lever on the cover plate. This can be done by removing the screw and nut attaching the cable toggle to the lever. Having released the toggle unscrew and remove the cable adjuster and cable (see Fig. F.5).

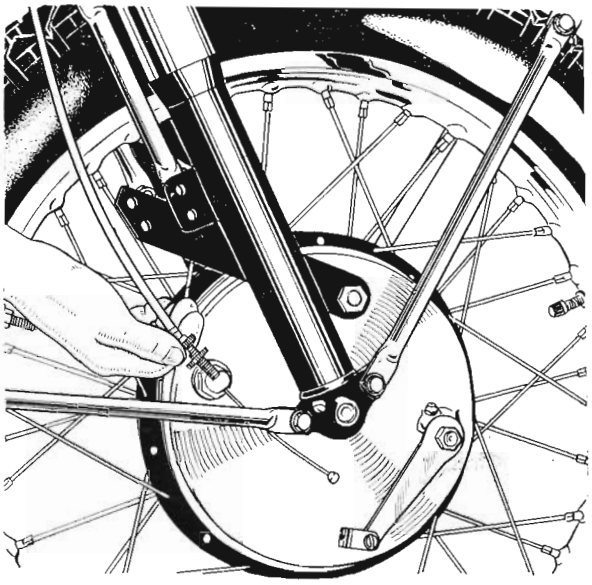

FIG. F.5. *Removing cable adjuster.*

Remove the brake anchor strap nut from the cover plate and slacken off the nuts at the other end to enable the removal of the strap from the plate.

Slacken off the pinch bolt in the left-hand fork end and using a bar through the head of the spindle unscrew the spindle in a clockwise direction (left-hand thread).

Support the wheel as the spindle is withdrawn and when it is clear the wheel can be pulled away from the right-hand leg and clear of the machine.

Try not to let the wheel fall on the brake side as this may displace the bush through the cover plate, if it does happen the bush can be retrieved and replaced with the wheel spindle.

**Front Wheel Replacement**

Lift the wheel between the fork legs and position the bush in the right-hand fork leg. Screw the spindle in anti-clockwise (left-hand thread) until it is nearly tight, position the brake plate and replace the anchor strap. Tighten the spindle then pump the forks up and down to position the left-hand leg and tighten the pinch bolt in the left-hand fork end.

Finally, replace the brake cable and adjust as necessary using the adjuster on the cover plate.

The cable adjuster on the handlebar is for cable adjustment when riding.

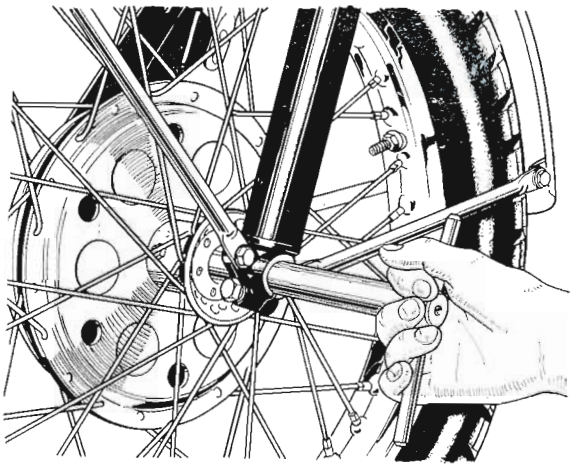

FIG. F.6. *Replacing the spindle.*

## FRONT BRAKE SHOES—QUICK-RELEASE HUB
### (1968 Victor Special)

The brake plate (A) is a push-fit on the bush (B) (see Fig. F.7).

To remove the brake shoes lever them upwards and outwards off the cam and fulcrum pin.

The shoes are of the conventional type (not floating) but are not interchangeable. Since one shoe is leading and the other trailing they must be fitted with the narrow side (relative to centre web) next to the brake plate.

Replacement brake shoes are available through the Exchange Service in the British Isles, but for those who cannot use this service the notes on relining on page F.12 may be of some assistance.

A grease nipple is provided for lubricating the cam spindle and it is advisable to check that the hole is not blocked by dirt. Be careful not to over-lubricate, grease must not get on to the linings.

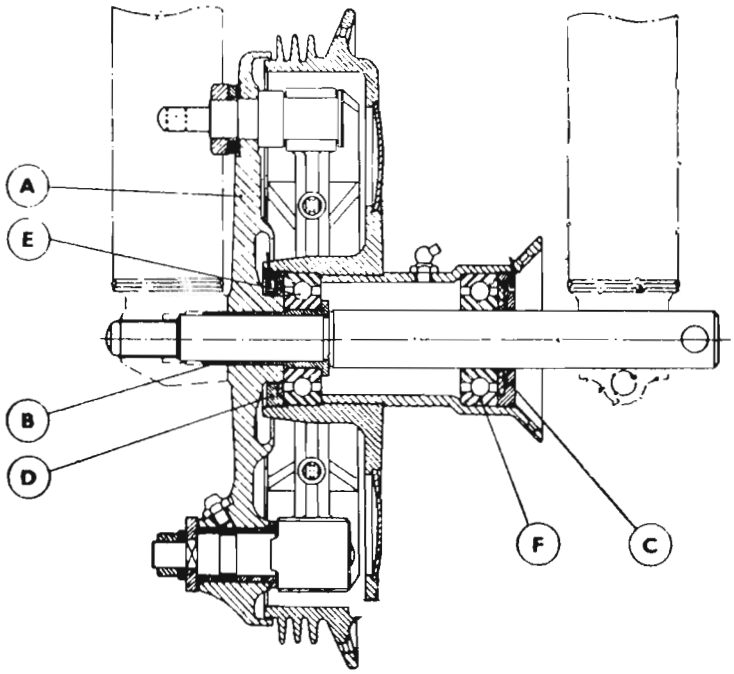


FIG. F.7. *Section of front hub.*

## REAR WHEEL
### (Victor Enduro and Special (U.S.A.) models prior to Frame No. B44EA.101

**Rear Wheel Removal and Replacement**

Place the machine on its stand and disconnect the rear chain at its spring link. Remove the chain from the rear wheel sprocket but ensure that it remains on the gearbox sprocket.

Take off the brake rod adjusting sleeve (A) and release the brake anchor strap—or torque arm—(D) from the swinging arm lug, the fixing bolt of which also secures the chainguide, chainguard and brake light switch.

Disconnect the speedometer cable at its drive unit on the hub and unscrew the wheel spindle nuts (B), so that the wheel can be withdrawn rearwards from the swinging arm fork ends.

If possible, avoid disturbing the setting of the chain adjusters (C) while the wheel is out of the frame and, when replacing the wheel, make certain that the adjusters are pressed firmly against the ends of the fork.

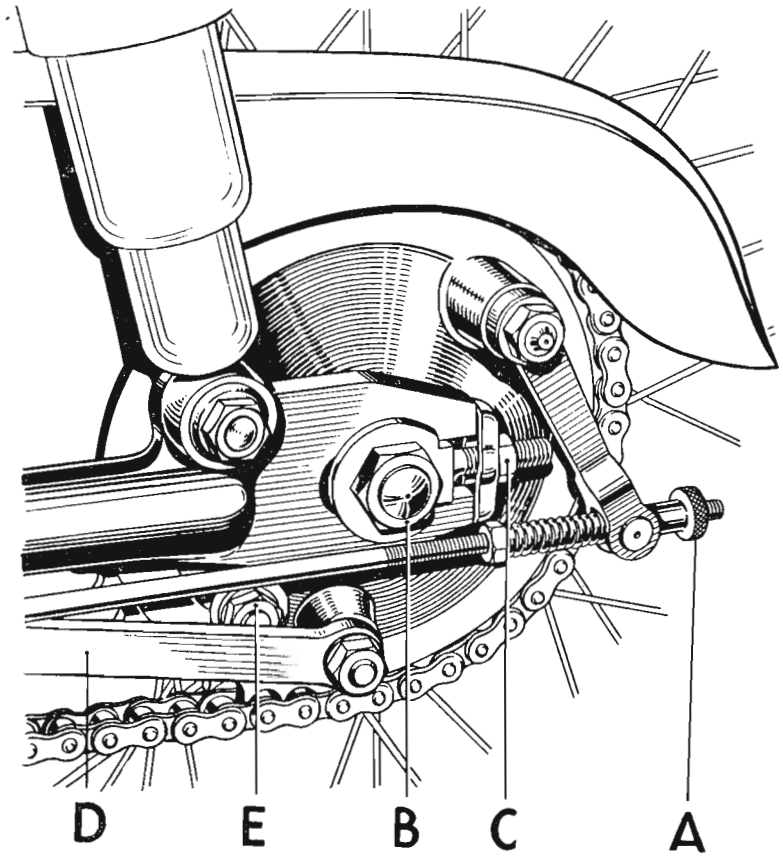


FIG. F.8.

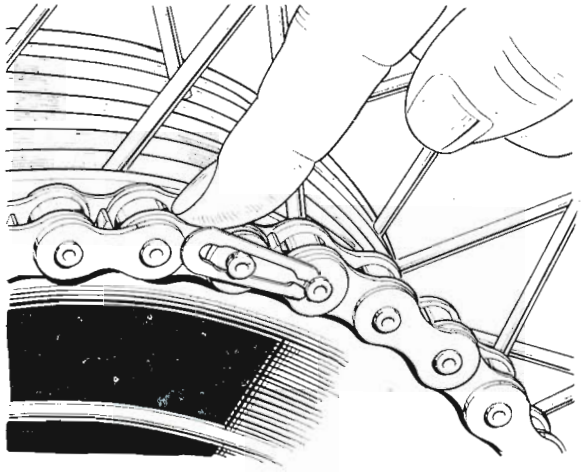

FIG. F.9.

Ensure also that the spring clip of the chain connecting link is correctly fitted and has its closed end pointing in the direction of travel of the chain (i.e. forwards on the top run)—see Fig. F.9.

For details of chain adjustment, see page F.11.

**Rear Brake Shoes**

Unscrew the brake cover retaining nut and take off the washer. The plate, complete with shoes and springs is a push-fit on to the spindle and no difficulty should be experienced in pulling it away from the brake drum.

To remove the shoes, lever them upwards and outwards off the cam and fulcrum pin. It is also possible to remove the shoes complete with springs, cam and fulcrum pin after first unscrewing the nuts on the outside of the plate.

The rear brake shoes are the same as each other but are not interchangeable with the front brake shoes.

Relined brake shoes are available to owners in the United Kingdom through the dealer network.

A grease nipple is provided for lubricating the cam spindle and it is advisable to check that the hole is not blocked by dirt. Be careful not to over-lubricate the cam; grease must not come into contact with the linings.

**Renewing Rear Wheel Bearings**

To obtain access to the bearings, first unscrew the left-hand bearing retainer.

Remove the large spindle nut on the right-hand side of the hub and pull off the speedometer drive unit, noting the distance pieces and driving dogs.

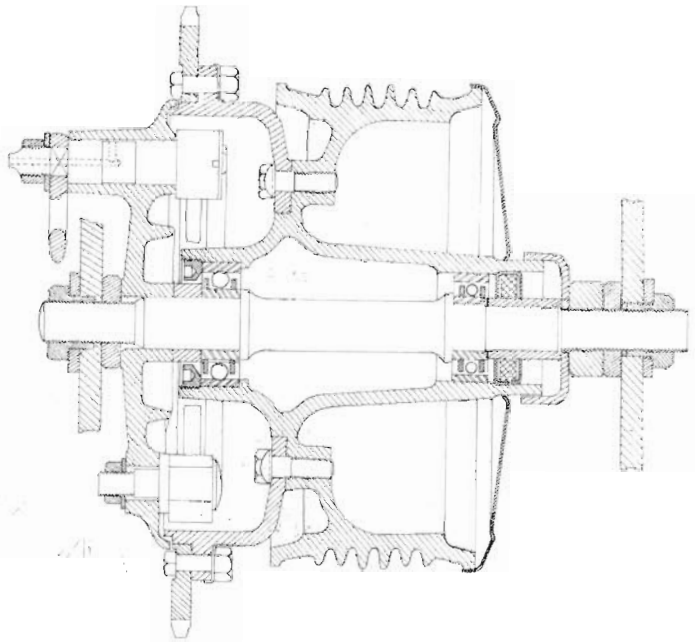

FIG. F.10. *Section of rear hub.*

Using a hide-mallet, drive the spindle through the brake side bearing, so driving out the right-hand bearing together with the felt washer, housing and plain washer.

The brake side bearing can now be driven out from the opposite side, again using the spindle or a suitable drift.

Replacement bearings can be fitted in the reverse order after lubricating with correct grade of grease (see page A.3).

Fit the drive-side bearing (the larger of the two) and ensure that its sides are close up to the abutment in the hub shell and the shoulder on the spindle. Screw in the bearing retainer tightly.

Insert the wheel spindle from the right-hand side and locate the right-hand bearing over the spindle. Using a suitable drift, drive in the bearing squarely until it is seated against the shoulder on the spindle.

Fit the plain washer, felt washer and housing and press down into the recess. Slide the distance piece over the right-hand spindle end and refit the speedometer drive unit, taking care to mesh the driving dogs. Finally, replace the shorter distance piece and screw on the spindle locknut, but do not tighten until the brake cover plate has been replaced.

## REAR WHEEL
### (Victor Enduro and Special (U.S.A.) models commencing Frame No. B44EA.101 and Grand Prix models)

**Rear Wheel Removal and Replacement**
Removal of the rear wheel does not affect the chain or brake adjustments.

Unscrew and withdraw the wheel spindle (D) Fig. F.8, using a suitable steel bar through the head. It has a normal right-hand thread and is therefore unscrewed in an anti-clockwise direction.

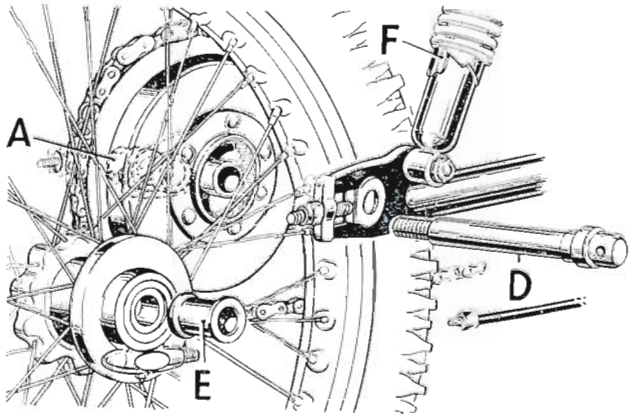


FIG. F.11. *Removal of rear wheel.*

The outer collar (E) should fall clear on removal of the spindle and the wheel can then be pulled away from the brake drum and withdrawn from the machine.

The Victor Enduro and Special (U.S.A.) models are fitted with a speedometer gearbox and care must be taken not to damage it as the wheel is removed.

It will not be necessary to disturb the wheel nut (A) on the left-hand side, as this retains the brake drum assembly.

Replace in the reverse manner but do not omit to refit the spindle outer collar.

**Wheel Hub Bearings**
The hub is fitted with two identical single-seal bearings which are a light press-fit on to the hollow spindle in the hub shell. The brake drum bearing is the same size as the hub bearings, but has a double oil seal.

To remove the bearings, first unscrew the bearing retainer on the left-hand side; this has a left-hand thread and is unscrewed in a clockwise direction.

Using a drift slightly under .875 in. diameter, drive out the hollow spindle from the left-hand side, releasing the right-hand bearing, inner collar and the hub end cover from the right-hand side.

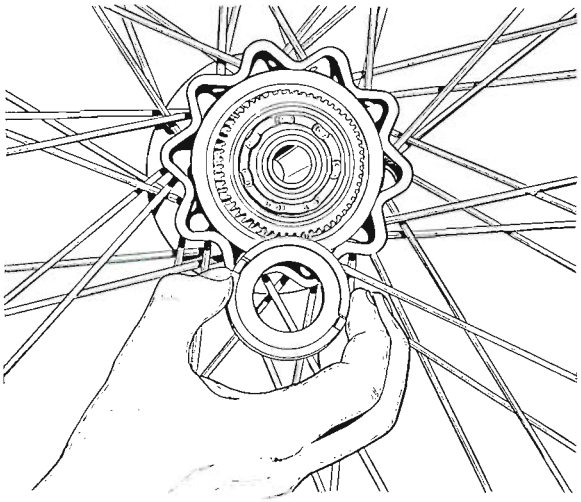

FIG. F.12. *Bearing retainer.*

The left-hand bearing and its thrust washer can now be driven out from the right-hand side.

The rubber oil seal for the left-hand bearing need not be disturbed and may be left in the hub

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

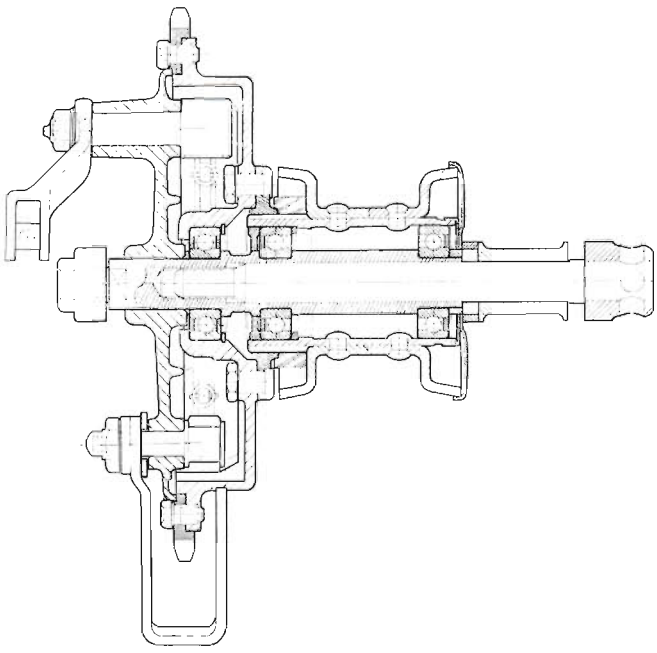

FIG. F.13. *Section of rear hub.*

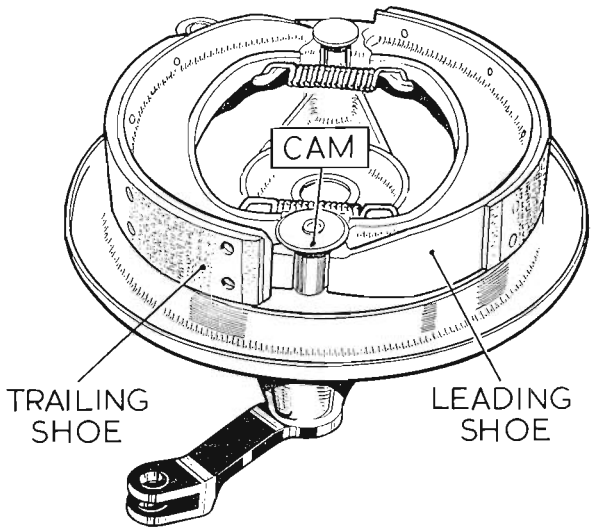


FIG. F.14.

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

Note that the hollow spindle is fitted with the short end on the left-hand side and also that the bearings are fitted with their oil seals outwards.

**Rear Brake Drum and Bearing**

The brake drum is retained in the rear fork end by the spindle nut and the self-locking nut securing the brake anchor strap and chainguide to the swinging arm lug.

To remove the drum, disconnect the rear chain at its spring link and unscrew the brake rod adjusting sleeve. Take off the spindle nut and the lower chainguide bolt, and withdraw the complete brake drum assembly.

The brake plate complete with brake shoes and springs, can now be lifted off the spindle. It is important to note that the brake shoes are fully floating and must be fitted as shown in

Fig. F.14. There is no need to disturb the cam spindle unless it is to be replaced, in which case the position of the brake lever should be noted to assist in reassembly.

The brake shoes and springs can be removed in the usual way.

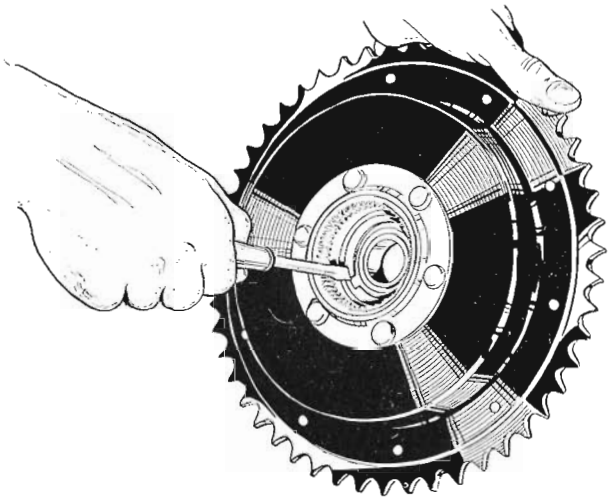

FIG. F.15. *Releasing bearing circlip.*

To remove the bearing, first drive out the spindle from the left-hand side and release the bearing circlip with steel washer. The bearing can now be driven out from the front of the drum using a suitable drift.

Reassembly is the reverse of the dismantling procedure but, do not omit to replace the steel washer under the bearing circlip so that it seats on the outer ring of the bearing, not the inner ring.

It should not be necessary to disturb the driving flange unless it is known to be worn and is being replaced.

To remove the flange, flatten the locking plates, unscrew the six bolts and withdraw.

When fitting the new flange, see that it enters the drum squarely and that the mating surfaces are clean. Replace the six bolts and, after tightening the nuts evenly, turn the edges of the locking plates over.

If the chainwheel teeth are hooked or the inside of the brake drum is badly scored they should be replaced.

**Brake Drum Replacement**

See that the spindle is pressed well into the bearing and replace the cover plate complete with brakes, shoes etc. Place the assembly into the fork end, and fit the chain adjuster, washer and nut, on to the spindle end. If the chain tension was correct, there will be no need to make any adjustment now. Do not tighten the spindle nut until the wheel has been replaced, so that the alignment can be made for the complete assembly.

See that the self-locking nut, securing the brake anchor strap and chainguide to the swinging arm lug, is tightened securely.

## BRAKE ADJUSTMENTS

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

The front brake adjuster is situated on the lower fork leg and rotation of the screwed sleeve alters the effective length of the cable, so adjusting the position of the shoes in the drum. The locknut should be tightened after adjustment.

A self-locking cable adjuster is also provided at the handlebar lever.

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

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

Both front and rear brake operating levers have serrated cam holes, enabling them to be removed and replaced in a new position to give finer brake adjustment.

When new brake shoes have been fitted or if, during dismantling of the wheel, the fulcrum pin was disturbed, the shoes must be centralised within the drum.

To do this, slacken the fulcrum pin nut and operate the brake cam so as to open the brake shoes. The fulcrum pin will then position itself in the housing until both shoes are pressing equally on to the drum. Tighten the fulcrum pin nut firmly and release the brake.

These instructions do not apply to the Victor Enduro and Special (U.S.A.) commencing frame No. B44EA.101 and Victor Grand Prix models as the rear brake shoes are of the fully floating type (i.e. they are not pivoted on a fulcrum) and are therefore self-centralising. A detachable brake cam housing is provided on the front brake, allowing the shoes to be automatically centralised. The housing must be free to move but should be checked frequently to ensure that the movement is not excessive.

## REAR CHAIN ADJUSTMENT

The rear chain must be adjusted when the wheel is at the lowest point of the suspension travel (when the wheel is raised clear of the ground).

Rotate the wheel slowly until the tightest point on the chain is found, then check its up and down movement in the centre of the chain run. The total movement should be 1⅛ in. and if it varies from this setting, the chain must be adjusted by moving the rear wheel either forwards, to increase slackness or backwards, to reduce slackness. As chains invariably stretch periodic inspection and adjustment is essential.

To adjust the chain, first slacken the wheel spindle nuts, the nuts retaining the anchor strap and the brake rod adjusting sleeve. Tighten both chain adjuster nuts evenly until the correct chain setting is obtained.

After adjustment ighten the wheel spindle and anchor strap nuts, re-check the setting of the chain and adjust the rear brake.

It is advisable to check the wheel alignment after any adjustment to the rear chain has been made; full details of this are given on page F.15.

## RENEWING BRAKE LININGS

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

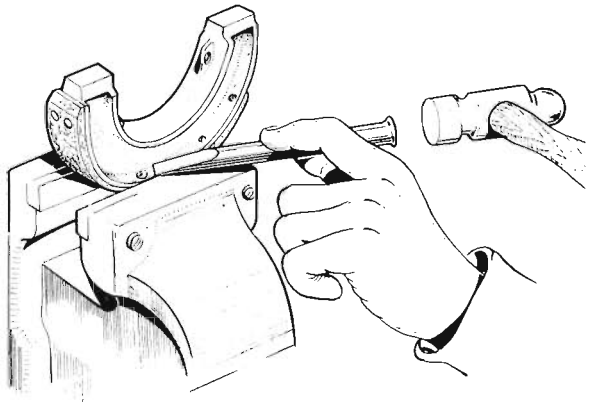

FIG. F.16.

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

Clamp the new lining tightly over the shoe and, using the shoe holes as a jig, drill straight through the lining with a 5/32 in. diameter drill.

Remove the clamps and, holding the lining carefully in the vice, counterbore or countersink (according to the type of rivet used) each hole to no more than two-thirds the thickness of the lining, i.e. if the lining is $\frac{3}{16}$ in. thick, then the counterbore must not be deeper than ⅛ in.

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

Place a suitable mandril in the vice, clamp the linings to the shoes with either small "G" or toolmakers clamps and peen-over the rivets as shown in Fig. F.17, working alternatively outwards from the centre.

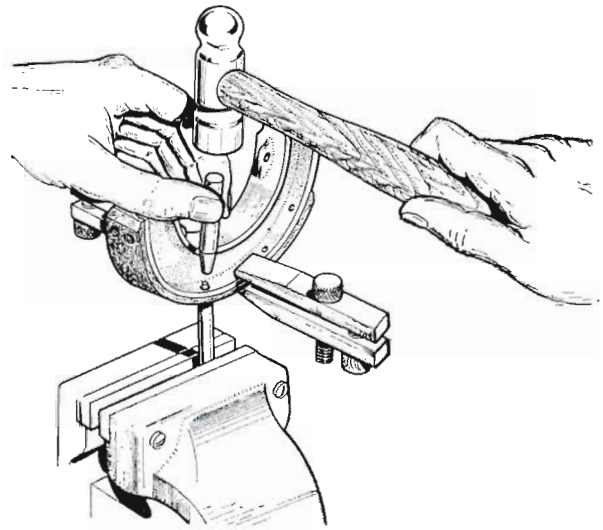

FIG. F.17.

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

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

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

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

## WHEEL BUILDING

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

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

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

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

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

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

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

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

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

### SECURITY BOLTS

Sometimes, particularly if a tyre is under-inflated, it will creep around the rim taking the tube with it.

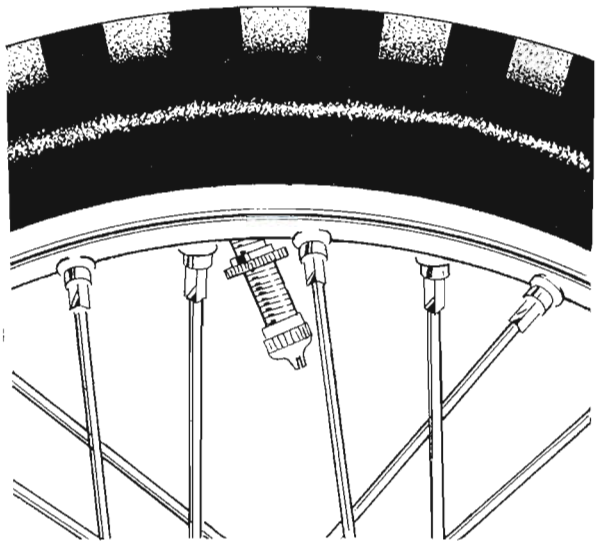

FIG. F.18. *Tyre creeping.*

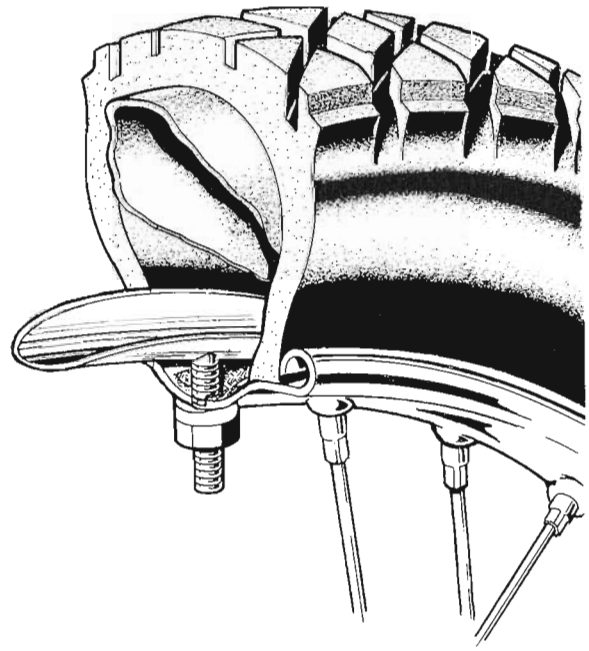

FIG. F.19. *Security bolt.*

If this is not stopped, it will ultimately pull the valve from the tube. Therefore, the wheel rims on the Victor models are fitted with security bolts; one on the front wheel and two on the rear.

Before attempting to remove or replace a tyre, the security bolts must be completely loose.

### WHEEL BALANCING

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

Weights are available for attaching to the spokes to counteract any out-of-balance but, before starting, ensure that the wheel is absolutely free and revolves quite easily. If the rear wheel is being treated remove the driving chain.

With the wheel clear of the ground spin it slowly and allow it to stop on its own. Now mark the top of the wheel or tyre and repeat two or three times to check.

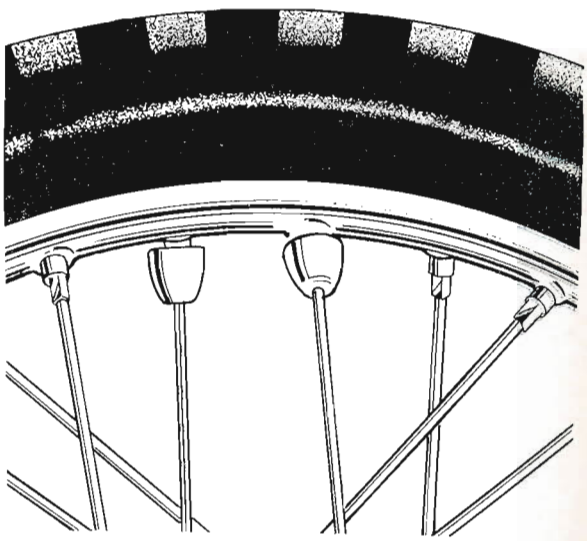

FIG. F.20. *Balance weights.*

If the wheel stops in the same place the extra weight must be added at the marked spot.

The next step is to ascertain how much weight is to be added, this can be done by sticking small pieces of plasticine to the nipples and re-check until the wheel will stop in any position without moving.

Having ascertained how much weight is required, a balance weight of exactly the same amount must be attached to the spokes at the spot originally marked.

## WHEEL ALIGNMENT

Steering will be affected if the wheels are the slightest bit out of alignment (out of track).

Since the front wheel cannot be adjusted in this respect, it is the rear wheel which must be aligned to the front wheel. The adjustment will be necessary whenever the chain is adjusted or the wheel removed. It is also necessary to adjust the rear brake whenever re-alignment has been carried out.

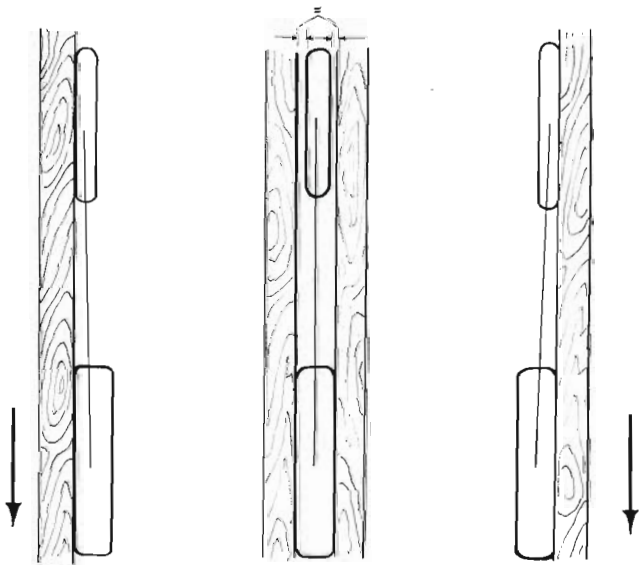


FIG. F.21. *Checking alignment.*

To check the alignment of the wheels a straight-edge of timber or steel is required approximately 80 in. long.

The straight-edge should be laid on blocks four to six inches high (alternately) each side of the machine.

If the tyres are the same size and the wheels in alignment the straight-edge will be touching the tyres at four points on each side.

If the front tyre is of smaller section then it should be as drawing (B) Fig. F.21.

If the alignment is as either (A) or (C) then the rear chain adjusters must be moved as indicated by the arrows to correct the alignment

Assuming that the chain adjustment is correct the movement of the rear wheel will be made on the right-hand side chain adjuster which should be screwed in or out as necessary after the spindle nuts have been slackened off.

A machine suffering accidental damage may have wheels so out of alignment that they cannot be corrected in this way. Frame, fork or wheel geometry may be basically upset, in these cases a specialist repairer can probably reset any offending assembly using information in Section D.

## TYRE REMOVAL

There are a few points about tyres which should be thoroughly understood.

(1) The beads have wire cores which cannot be stretched over the rim flanges without damage.

(2) Removal and replacement will be simpler if the beads are pressed right down into the well of the rim except at the point being "worked". The well is the centre section.

(3) The tyre beads will slip over the rim quicker and damage will be avoided if the beads and the levers are lubricated with soapy water.

Unscrew and remove the valve core to deflate the tyre.

Some valve caps are designed for this purpose but, if the cap is plain and a core removal tool is not available, depress the centre of the valve and keep "treading" the tyre to expel the air. Remove the nut(s) on the security bolt(s) and push the bolt(s) into the cover.

Press each bead off its seat into the well of the rim.

Insert the lever at the valve position, and while levering, press the bead into the well diametrically opposite the valve.

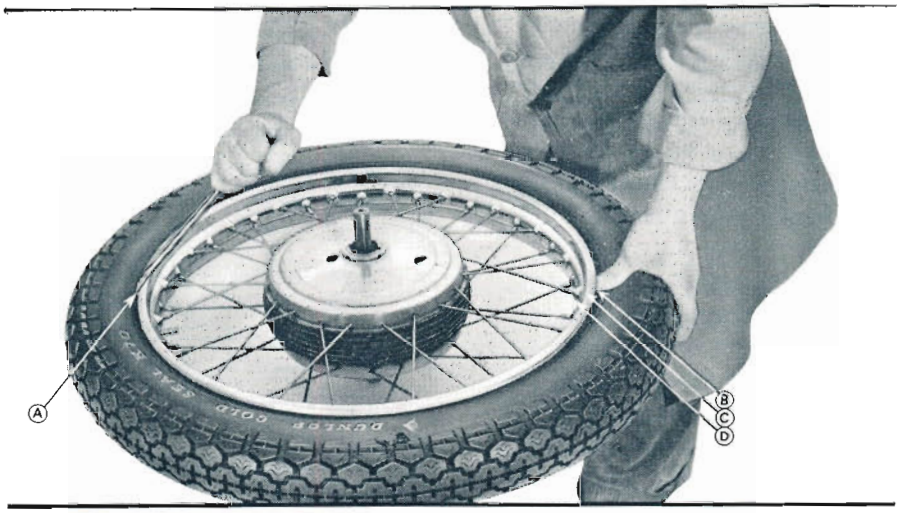


FIG. F.22

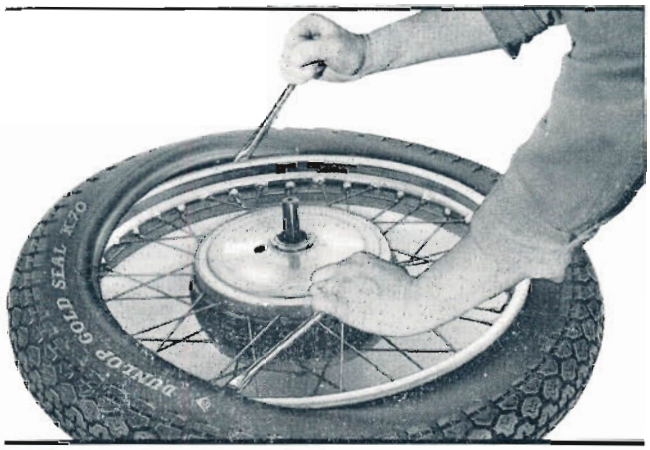


FIG. F.23. *Removing the first bead.*

It will not be possible to pull the cover bead at (A) over the rim flange until the cover bead at (B) is pushed off the bead seat (C) down into the well (D). Then the cover bead at (A) comes over the rim flange easily.

Insert a second lever close to the first and prise the bead over the flange holding the free part with the other lever.

Remove one lever and insert further along the tyre continuing every two to three inches until the bead is completely removed (see Fig. F.23).

Take care when inserting levers not to pinch the inner tube as this will result in a puncture. Take out the security bolt(s), lift the valve out of the rim and remove the tube.

Stand the wheel upright, insert a lever between the remaining bead and the rim and pull the cover back over the flange as in Fig. F.24. Do not forget to press the bead diametrically opposite the lever into the centre of the rim and to apply a soapy solution to the rim flange.

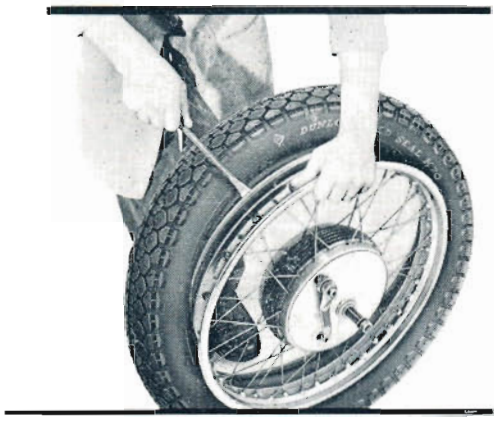

FIG. F.24.

**TYRE REPLACEMENT**

Before a tyre—new or used— is replaced, it should be carefully checked inside and outside for loose objects or nails, flints, glass and cuts. Do not forget that although there may be nothing visible outside there could be a nail projecting inside. When repairing a tyre or tube be patient and see that the area of the repair is absolutely clean before applying solution. A rag dampened with petrol will help to clean the area, but it must be completely dry before solution is applied.

Remember that when replacing the tyre, it is very easy to cause another puncture by nipping the inner tube with the levers.

Some new tyres have balance adjustment rubbers inside the casing, they are not patches and should not be disturbed.

When there is a white spot near the tyre bead, it should be placed at the security bolt position on the front wheel or midway between the security bolts on the rear wheel. This will ensure a high degree of tyre balance.

If the spokes have been tensioned, or replaced, see that they are not projecting through the nipples. File flush any that are showing through. Replace the rim tape with the rough side next to the rim.

Place the security bolt(s) in position and fix loosely with nut(s). Fit the tube in the tyre and inflate just sufficient to round it out without stretch.

Too much air makes fitting difficult, and too little will make the tube more liable to be nipped by the levers. Dust the tube and inside the cover with dusting chalk.

Lubricate the cover beads and the rim flanges with a soap and water solution or liquid soap.

Pull the tube slightly out of the cover so that it protrudes about 1 in. beyond the beads for about 4—5 in. each side the valve as in Fig. F.25.

Squeeze the beads together at the valve to prevent the tube slipping back and offer the cover to the rim as shown in Fig. F.26, at the same time passing the valve through the holes in the tape and rim.

Allow the lower bead to go into the well of the rim and the upper bead to be above the rim flange.

Working from the valve outwards, press the lower bead over the rim flange by hand, moving along in short stretches, and ensuring that the bead lies right down in the well of the rim—this is most important (see Fig. F.27). If necessary use a tyre lever for the last few inches as in Fig. F.28.

Turn the wheel over and check that the bead is concentric with the rim before proceeding further.

Reverse the wheel again and press the upper bead into the well of the rim diametrically opposite the valve.

Insert a lever as close as possible to the point where the bead passes over the flange, and lever the bead over at the same time pressing a fitted portion into the well of the rim.

Repeat progressively round the tyre until the bead is completely over the flange, finishing at the valve (see Fig. F.29).


FIG. F.25. *Cover and tube assembled ready for fitting.*

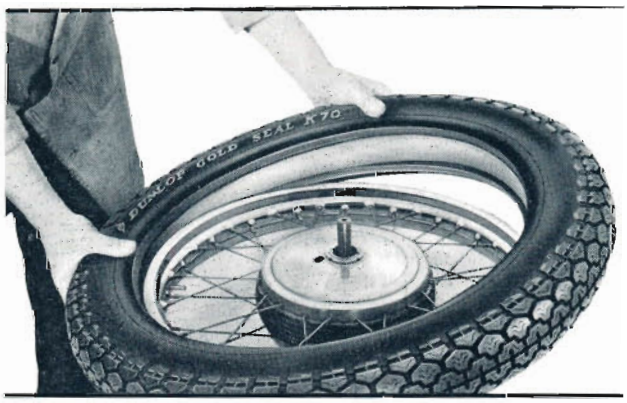


FIG. F.26. *Commencing to fit the tyre.*

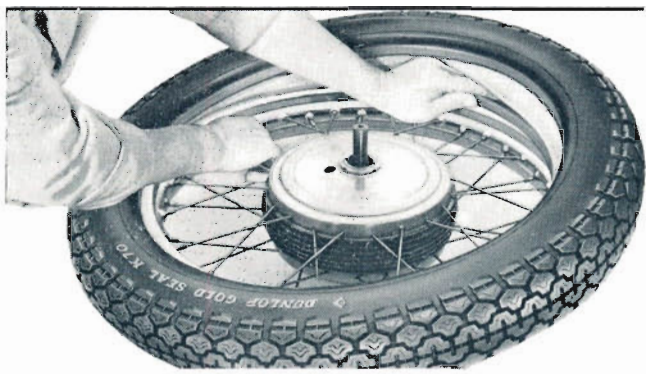


FIG. F.27. *Fitting the first bead.*


FIG. F.28. *Completing the fitting of the first bead.*

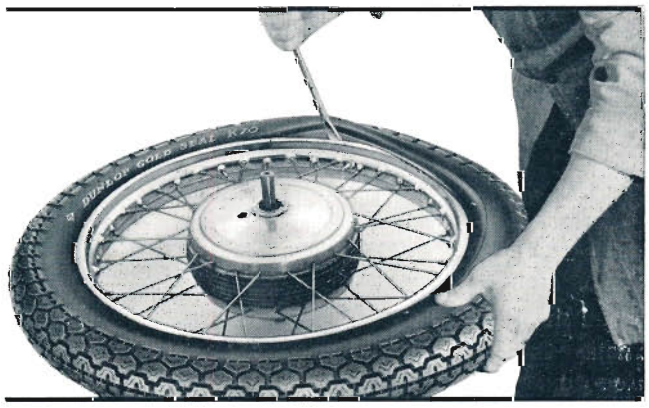


FIG. F.29. *Completing the fitting of the second bead.*

Push the valve inwards to ensure that the tube adjacent to the valve is not trapped under the bead, then pull the valve back firmly into position. Also ensure that the tube is resting on the flap(s) of the security bolt(s) and is overlapping the sides.

Before inflating, check that the fitting line on the tyre wall just above the bead on each side is concentric with the rim.

If necessary bounce the wheel to help seat the tyre but, see that there is adequate pressure to prevent damaging the tyre or tube and only use moderate force. If the tyre will not seat, it is better to release the pressure, apply soap solution to lubricate and re-inflate.

Inflate to the required pressure and check fitting lines again. Inflation should not be too rapid, particularly at the commencement, to allow the beads to seat correctly on the rim.

See that the valve protrudes squarely through the valve hole before screwing down the knurled nut and replace the dust cap.

Finally, tighten down the nut(s) on the security bolt(s).

## TYRE PRESSURES

**Victor Enduro and Special (U.S.A.):**—The recommended inflation pressures of 16 lb. per square inch for each tyre are based on a riders' weight of 140 lb. If the riders' weight exceeds 140 lb. the tyre pressure should be increased as follows:

FRONT TYRE:—Add 1 lb. per square inch for every 28 lb. in excess of 140 lb.

REAR TYRE:—Add 1 lb. per square inch for every 14 lb. in excess of 140 lb.

**Victor Grand Prix:**—The tyre pressures should be determined by the riders' own requirements and the nature of the terrain in which the machine will be used.

## INDEX

## INTRODUCTION

To cater for special machines such as the Victor Series, which are high-performance Trials and Scrambles machines, Lucas engineers have developed a special RM19 type alternator and "energy transfer" ignition coil. The alternator windings comprise of two sets of series connected coils, one set of two being used for direct lighting (on Victor Enduro and Special (U.S.A.) models only), the other set of four being connected solely for ignition purposes.

The alternator and ignition coil are similar in operation to a megneto whilst retaining the physical characteristics of the conventional coil ignition system namely, separate ignition coil and contact breaker, and are designed for continuous use without a battery in circuit; this is particularly advantageous in competition work.

## DESCRIPTION

**Stator**
The stator is wound with six coils. Four series connected coils are used for the ignition system, being permanently connected across an "energy transfer" coil model 3E.T. The remaining two coils of a slightly heavier gauge wire, supply the current for lighting on the Victor Enduro and Special (U.S.A.) models. These lighting coils will supply sufficient current for the 6-volt 30/24 watt headlamp bulb together with a 6-volt 6/18 watt tail lamp bulb, i.e. 36/42 watt.

Five wires are brought out from the stator for connecting to the external circuit. The red lead from the lighting coils and the black/yellow lead from the ignition coils are both earthed to the frame of the machine. The black/white lead is connected to the contact breaker and primary winding of the "energy transfer" coil.

The brown/blue lead is connected to the lighting switch and the brown lead to the stop lamp switch. These leads of course, remain unconnected on the Victor Grand Prix models.

**Rotor**
The rotor has an hexagonal steel core, each face of which carries a high-energy permanent magnet, keyed to a laminated pole tip. The pole tips are rivetted circumferentially to aluminium side plates, the assembly being cast in aluminium and machined to give a smooth external finish.

**Ignition Coil**
The 3E.T. coil has been specially designed for use in "energy transfer" ignition systems. It employs a closed iron circuit and a primary winding, whose impedance is closely matched with that of the alternator ignition generating coils, resulting in a high performance characteristic, particularly for starting.

## WORKING PRINCIPALS

One of the main features of an "energy transfer" ignition system, is that the ignition coil primary is connected in parallel with the contact breaker points, in the conventional coil ignition circuit the primary winding and the contact breaker are connected in series. In practice this means that the current generated in the alternator ignition coils can flow direct to earth through the contact points (when they are closed) but when they are open, its alternative path to earth is via the ignition coil primary. The sequence of events which, of course, takes place at high speeds, due to the action of the contact breaker, is as follows.

With the contact breaker points closed, the ignition generating coil of the alternator (one end of which is permanently connected to the machine frame) are in effect short-circuited, causing a heavy current to circulate in them. When the contact breaker points open, the short-circuit is removed and the built-up energy, circulated in the generating coils is rapidly transferred to the primary of the ignition coil. The effect of this "high energy" pulse in the ignition primary induces a high voltage in the secondary winding, which is then transmitted through the high-tension cable to the sparking plug. The contact breaker is designed to open only at instants of peak current in the generating cycle, thus en-

suring that the ignition system receives maximum energy.

Another feature worth noting is that the "energy transfer" system operates on a rising current in the ignition coil primary and not, as in the conventional coil ignition system, on a falling current.

## SYSTEMATIC FAULT LOCATION

The following notes detail the procedure to be adopted in the event of trouble developing with the equipment.

**(1) Engine Fails to Start**

(1) Remove the high-tension lead connected to the sparking plug and hold it approximately ⅛ in. from the engine cylinder block. The gap should spark at normal "kick-start" speed. Check that plug gap is as quoted in General Data, if plug electrodes are worn or insulation cracked, plug should be replaced. Reconnect high-tension lead to plug and again check for sparking with plug resting on cylinder head. If plug gap sparks refit and proceed to check fuel supply, carburation etc.

NOTE:—It is essential that the correct plug gap is maintained—a wider gap will cause difficult starting or perhaps failure to start. Accurate timing is also a critical factor in starting and the recommended settings should be adhered to (see page GD.3).

If there is no spark, or if the engine still cannot be started, proceed to check ignition system as follows:—

(2) Check that contact breaker gap is correctly set, the gap should be maintained at .014—.016 in. Check the capacitor by substitution.

(3) Place a piece of dry card between contact breaker points. Disconnect the ignition feed from the harness (black/white cable), and using a 2 volt cell of a 6 volt or 12 volt battery, with an ammeter in series, check the ignition coil primary for continuity. The primary winding has a resistance of approximately 0.5 ohms; the reading on the meter should not be more than 4 amp. An excessive reading indicates shorted turns whilst no reading will indicate open-circuit or earthed turns. In either event a replacement coil should be fitted.

If coil proves to be satisfactory, proceed to check the alternator ignition coils as follows:—**remove rotor** and

(4) Connect the 2 volt battery and ammeter across the alternator ignition coil feed and earth (frame of machine). The resistance of the coils is approximately 4 ohms and the reading should be approximately 0.5 amp.

An excessive reading indicates shorted turns whilst no reading will indicate open-circuit or earthed turns. In either event a replacement coil or stator is required.

NOTE:—This test must be done as quickly as possible to avoid damage to coils through overheating and misleading readings due to increase in coil resistance with temperature rise. It will be found that two to three seconds duration gives ample time to observe the ammeter readings.

On no account should this test be made with the rotor in position, otherwise partial demagnetisation will result.

If after carrying out the above tests the engine will not start though the stator windings, ignition coil, etc., are satisfactory, then the rotor may have become partially demantised resulting in a low output performance. As this is an extremely rare occurance it is advisable to check by substitution before returning the rotor to the manufacturer for re-magnetisation.

**(2) Engine Difficult to Start or Runs Intermittently**

If after checking as detailed in (**1**/1 and **1**/2) trouble still persists, it will be necessary to proceed as detailed in (**1**/3) and (**1**/4).

**(3) (Victor Enduro and Special (U.S.A.) only)—No Lights with Lighting Switch in Head or Dip Position, and Engine Running.**

(5) First check for burnt out filaments by substitution. Check wiring and connections between headlamp bulb and dip switch, dip switch and lighting switch, alternator and switch,rectifying as necessary.

Check continuity of lighting switch.

NOTE:—Poor earth connections can be particularly troublesome, and will cause high voltages which reduce bulb life. Burnt-out or blackened bulbs often indicate the existence of bad earths, which should be rectified before fitting new bulbs. The earthed side of both the lighting and ignition coils is brought out and connected externally to the frame of the machine. A bad connection at this earth point will, if allowed to persist, result in damage to the contact breaker points as well as to the bulbs.

If the lights will not work after carrying out the above procedure, and bulbs, wiring and switches, etc., have proved satisfactory, check the alternator lighting coils as follows:—

(6) With the 2 volt battery and ammeter connected across the lighting coil feed and earth (frame of machine), the meter should read approximately 6½ amps. An excessive reading will indicate shorted turns, no reading will indicate an open-circuit or earthed turns. In either event a replacement coil or stator is required.

NOTE:—This test must be done as quickly as possible to avoid damage to coils through overheating, and misleading readings due to increase in coil resistance with temperature rise. It will be found that two to three seconds duration gives ample time to observe the ammeter readings.

On no account should this test be made with the rotor in position, otherwise partial demagnetisation will result.

## SPARKING PLUGS

It is recommended that the sparking plug be inspected, cleaned and tested every 5,000 miles (4,800 km.) and a new one fitted every 10,000 miles (9,600 km.).

If the machine is to be used solely for competition purposes, the sparking plug should be inspected and serviced before every event.

NOTE:—After warming up the engine before the start of an event, it is advisable to remove the sparking plug and replace it with a fresh one, to ensure maximum efficiency whilst running.

To remove the sparking plug a box spanner (13/16 in., 19.5 mm. across flats) should be used and if any difficulty is encountered a small amount of penetrating oil should be placed at the base of the sparking plug and time allowed for penetration.

Examine the plug for signs of petrol (gasoline) fouling. This is indicated by a dry, sooty, black deposit, which is usually caused by over-rich carburation, although ignition system defects such as a faulty contact breaker, coil or condenser defects, or a broken or worn out cable may be additional causes.

Examine the plug for signs of oil fouling. This will be indicated by a wet, shiny, black deposit on the central insulator. This is caused by excessive oil in the combustion chamber during combustion and indicates that the piston rings or cylinder bore is worn.

To rectify this type of fault the above mentioned items should be checked with special attention given to carburation system.

Over-heating of the sparking plug electrode is indicated by severely eroded electrode and a white, burned or blistered insulator. This type of fault can be caused by weak carburation or over-advanced ignition timing, although plugs which have been operating whilst not being screwed down sufficiently can easily become over-

heated due to heat that is normally dissipated through to the cylinder head not having an adequate conducting path. Over-heating is normally symptomised by pre-ignition, short plug life, and "pinking" which can ultimately result in piston crown failure. Unnecessary damage can result from over-tightening the plugs. To achieve a good seal between the plug and cylinder head, screw the plug in by hand on to its gasket, then lightly tighten with a box spanner.

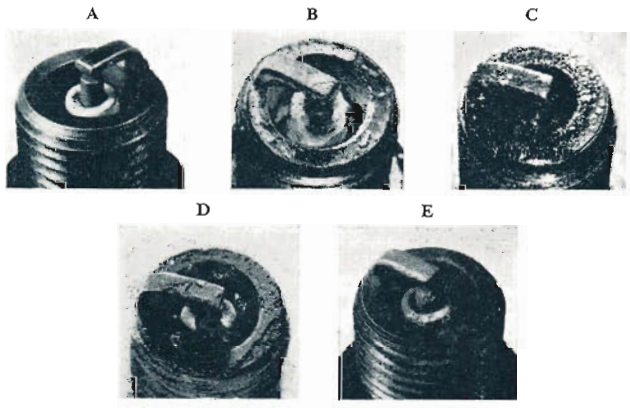


FIG. G.1. *Sparking plug diagnosis.*

A plug of the correct grade will bear a light flaky deposit on the outer rim and earth electrode, and these and the base of the insulator will be light chocolate brown in colour. A correct choice of plug is marked (A). (B) shows a plug which appears bleached, with a deposit like cigarette ash; this is too "hot-running" for the performance of the engine and a cooler-running type should be substituted.

A plug which has been running too "cold" and has not reached its self-cleaning temperature is shown at (C). This has oil on the base of the insulator and electrodes, and should be replaced by a plug that will burn off deposits and remove the possibility of a short-circuit. The plug marked (D) is heavily sooted, indicating that the mixture has been too rich, and a further carburation check should be made. At illustration (E) is seen a plug which is completely worn out and in need of replacement.

To clean the plug it is preferable to make use of a properly designed proprietary plug cleaner. The makers instructions for using the cleaner should be followed carefully.

When the plug has been carefully cleaned, examine the central insulator for cracking and the centre electrode for excessive wear. In such cases the plug will have completed its useful life and a new one should be fitted.

Finally, the sparking plug electrodes should be adjusted to the correct gap setting of .025 in. (.635 mm.). Before refitting sparking plug the threads should be cleaned by means of a wire brush and a minute amount of graphite grease smeared on to the threads. This will prevent any possibility of thread seizure occurring.

If the ignition timing and carburation settings are correct and the plug has been correctly fitted, but over-heating still occurs then it is possible that carburation is being adversely affected by an air leak between the carburetter and the cylinder head. This possibility must be checked thoroughly before taking any further action. When it is certain that none of the above mentioned faults are the cause of over-heating then the plug type and grade should be considered.

Normally the type of plug quoted in General Data is satisfactory for general use of the machine, but in special isolated cases, conditions may demand a plug of a different heat range. Advice is readily available to solve these problems from the plug manufacturer who should be consulted.

## BENCH TESTING

**3E.T. Ignition Coil**

A four-lobe D.K. type contact breaker having closed periods of not less than 42° and having an operating range up to 750 r.p.m. is required. Also, a 12 volt battery, a 3-point rotary spark gap and 1 ohm resistor approximately 15 watt.

Proceed to test as follows:—

Connect the 12 volt battery, contact breaker and resistor in series with the coil primary winding. Battery polarity should be such that the negative side of battery is connected to the earthed end of the primary.

Also connect with a jumper lead, the spark gap point that is farthest from the ionising electrode, to the negative side of the circuit.

Connect the high-tension cable from coil to the 3-point spark gap to the electrode nearest the ionising point.

Run the contact breaker at 750 r.p.m. Regular sparking should occur at the spark gap which should be set to 8 mm. (approximately 14 Kv). This test should not be continued for more than 30 seconds because the arcing of the contacts will be fairly heavy, due to the slow-running speed and low primary resistance.

**Alternator Lighting Coils—D.C. Output Test**
The lighting coil output can be checked by feeding it through a bridge rectifier standard type into a 6 volt battery. The battery should have a *rheostat connected across it which should be adjusted as necessary to maintain the 6 volt potential during testing.

Also in parallel with battery, connect voltmeter to measure potential.

The battery and ammeter should then be connected in series with the lighting coils and readings taken at the following alternator speeds.

| ALTERNATOR R.P.M. | OUTPUT IN AMPS INTO 6 VOLT BATTERY |
|---|---|
| 2,000 | 2.8 (minimum) |
| 5,000 | 5.3 (maximum) |

*Capable of carrying 10 amps without overheating.

**Alternator Ignition Coils—D.C. Output Test**
Using the same test gear and procedure as detailed for the lighting coil tests, the ignition coil output readings are as follows:—

| ALTERNATOR R.P.M. | OUTPUT IN AMPS INTO 6 VOLT BATTERY |
|---|---|
| 2,000 | 1.4 (minimum) |
| 5,000 | 1.8 (maximum) |

The stator complete, or individual coils should be replaced if the output readings for either or both the ignition and lighting coils are outside the figures quoted.

When the alternator stator and rotor are refitted to the machine, it must be possible to pass a .008 in. feeler gauge round the whole circumference of the rotor in the air gap between the rotor and the stator poles.

## HEADLAMP (Victor Enduro and Special (U.S.A.) only)

**Description**
The headlamp bulb is of the pre-focus type and access to the unit is gained by withdrawing the rim, glass and reflector assembly. To do this, slacken the screw at the top of the headlamp shell, just behind and adjacent to the rim, and prise off the rim and light unit assembly.

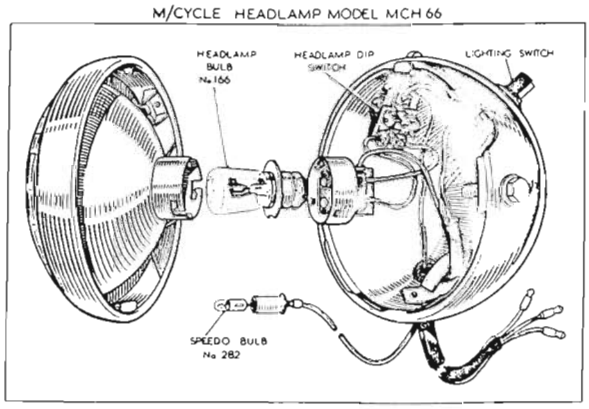


FIG. G.2.

To remove the bulb, press the cylindrical cap inwards and turn anti-clockwise to release. The bulb can now be withdrawn from its housing.

When fitting a new bulb, note that it locates by means of a cut-away and projection arrangement. Also note that the tabs on the cap are staggered to prevent incorrect reassembly. Check the replacement bulb type voltage and wattage specification before fitting.

Focussing for this type of unit is not necessary and no provision has been made for such.

**Beam Adjustment**

The beam must at all times be set as specified by local lighting regulations. For the United Kingdom, the Transport Lighting Regulations read as follows:—

> A lighting system must be arranged so that it can give a light which is incapable of dazzling any person standing on the same horizontal plane as the vehicle at a greater distance then 25 feet from the lamp, whose eye level is not less than 3 feet 6 inches above that plane.

Of course, these instructions may require amendment to comply with overseas lighting regulations.

The headlamp must therefore be set so that the main beam is directed straight ahead and parallel with the road when the motorcycle is fully loaded. To achieve this, place the machine on a level road, facing a wall at a distance of 25 feet away. With a rider and passenger seated on the machine, slacken the headlamp fixing bolts and move the lamp until the correct setting is obtained. Tighten the fixing bolts and recheck the setting. Do not forget that the headlamp should be on "full-beam" lighting when carrying out the above adjustment.

## TAIL AND STOP LAMP UNIT
**(Victor Enduro and Special (U.S.A.) only)**

Access to the double filament, tail and stop lamp bulb is achieved by unscrewing the two lens retaining screws. The bulb is of the offset pin type, thus ensuring that the replacement is fitted correctly into the bulb holder.

Check that the two supply leads are properly connected and see that the earth lead to the bulb holder is in satisfactory condition. When refitting the lens, do not overtighten the fixing screws or the lens may fracture.

## SPEEDOMETER LIGHT
**(Victor Enduro and Special (U.S.A.) only)**

The bulb holder is simply a press-fit into the base of the speedometer head and is withdrawn complete with the screw type 6 volt 3 watt bulb. Check that its cable is securely connected to the dip switch terminal.

Also check that the grommet in the headlamp shell is in good condition, otherwise the insulation on the cable may begin to wear and eventually cause a short-circuit.

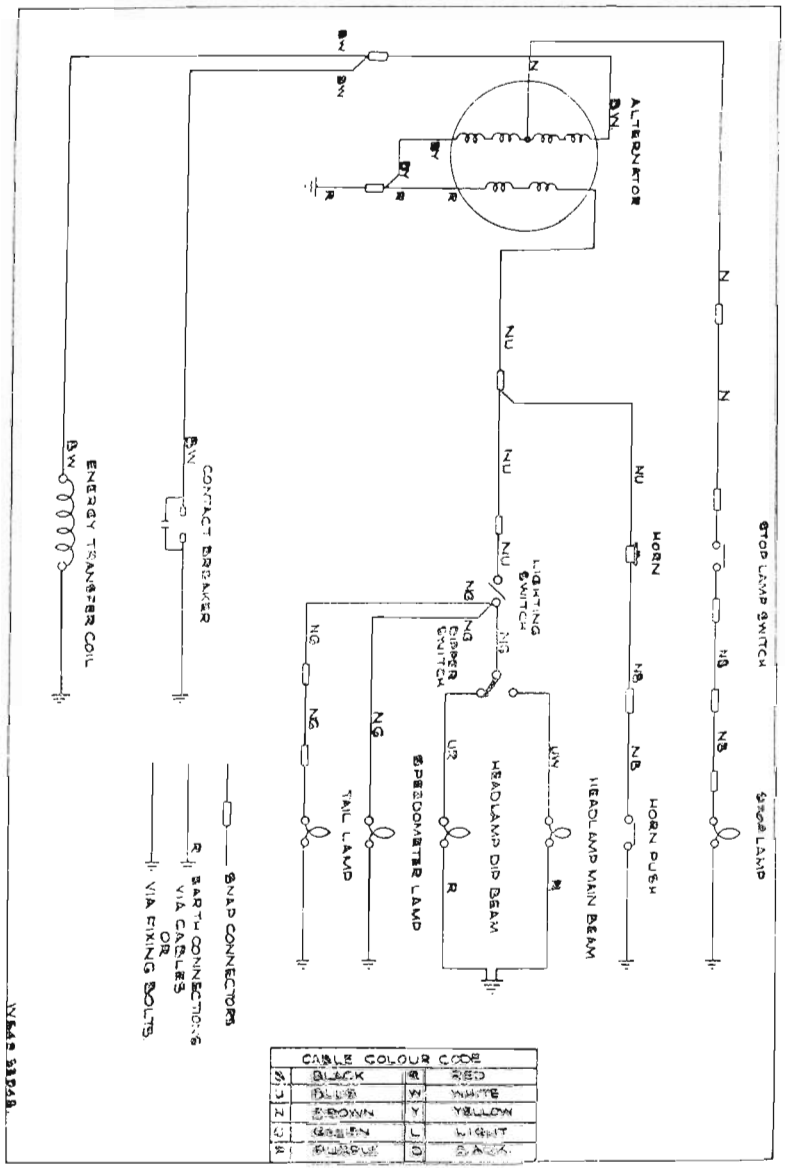


FIG. G.3.
*Wiring diagram for Victor Enduro and Special (U.S.A.).* NOTE:—Models made on and after Frame No. B44EA.101 are fitted with a bulb-type horn

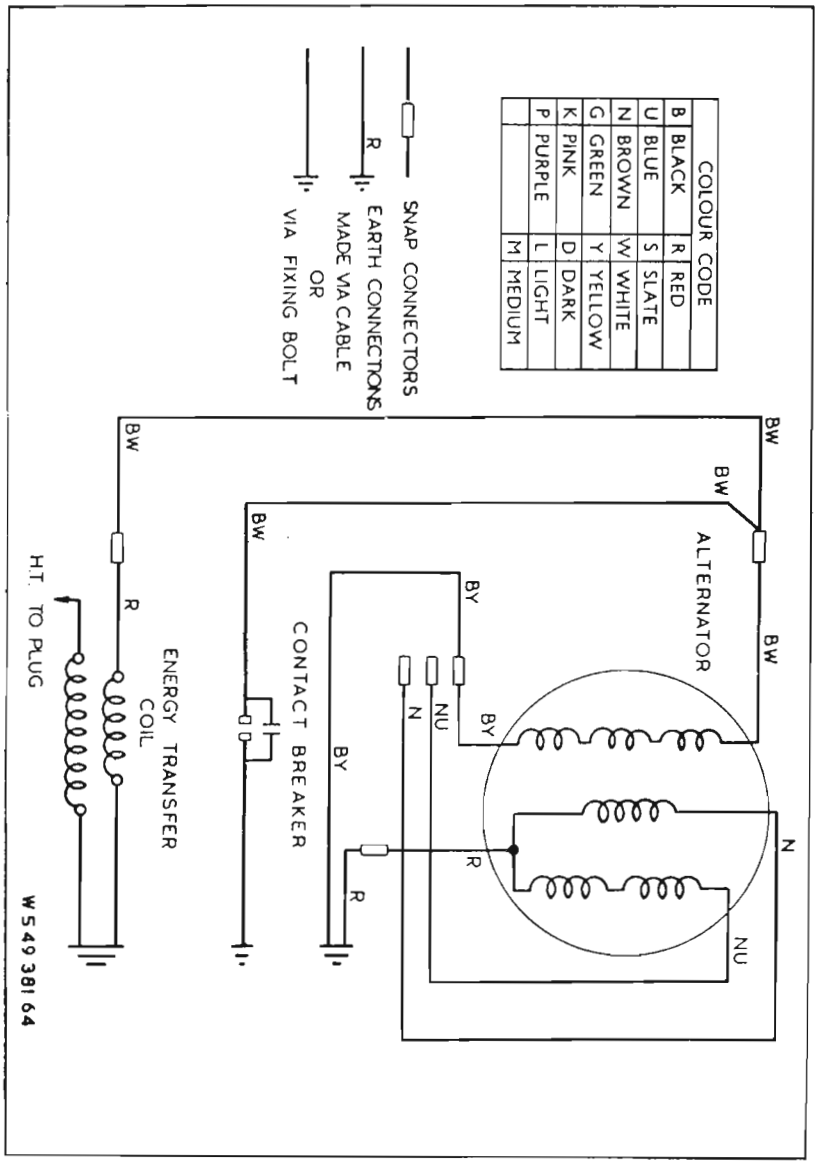


FIG. G.4.
*Wiring diagram for Victor Grand Prix.*

## B44 VICTOR SPECIAL (1968)

### INTRODUCTION

The electrical system is supplied from generator, model RM.21 contained in the primary chaincase and driven from the engine shaft.

A Zener Diode is connected in circuit to regulate the battery charging current and thereby prevents over-charging.

The current supplied to the ignition system is controlled by a contact breaker, driven direct from the camshaft.

Routine maintenance needed by the various components is detailed in the following sections. Whilst checking the electrical system, opportunity should be taken to ensure that all wiring connections and frame earthing points are clean and secure.

### ALTERNATOR

The alternator consists of a spigot-mounted 6-coil laminated encapsulated stator with a rotor carried on and driven by an extension of the crankshaft. The rotor has an hexagonal steel core, each face of which carries a high-energy permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to aluminium side plates, the assembly being cast in aluminium and machined to give a smooth external finish.

There are no rotating windings, commutator, brushgear, bearings or oil seals and consequently the alternator requires no maintenance apart from occasionally checking that the snap connectors in the output cables are clean and tight.

If rotor removal is necessary, there is no need to fit magnetic keepers to the rotor poles. When removed, wipe off any swarf which may have been attracted to the pole tips and put the rotor in a clean place until required for refitting.

### BATTERY INSPECTION AND MAINTENANCE

**Description**

The container for the model PUZ5A battery is moulded in transparent material through which the acid can be seen. The tops of the containers are so designed that when the covers are in position, the special anti-spill filler plugs are sealed in a common venting chamber. Gas from the filler plugs leaves this chamber through a vent pipe. Polythene tubing may be attached to the vent pipe to lead the corrosive fumes away from any parts of the machine where they might cause damage.

**PART A.**

**Charging the Battery**

Whilst the battery leaves the factory in the fully "dry-charged" condition, it may slowly lose some charge in storage. In view of this, the following filling instructions must be carefully observed:—

With the acid, battery and room temperature between 60°F., and 100°F. (15.5—37.7°C.), remove the vent plugs and fill each cell to the coloured marker line.

Measure the temperature and specific gravity of the electrolyte in each of the cells.

Allow to stand for 20 minutes and then recheck the temperature and specific gravity of the electrolyte in each cell.

The battery is then ready for service **unless** the above checks show the electrolyte temperature to have risen by more than 10°F. (5.5°C.) or the specific gravity to have fallen by more than 10 "points", i.e., by more than 0.010 specific gravity. In this event, it will be necessary to recharge the battery at the appropriate charge rate (0.7 amperes) until the specific gravity values remain constant for three successive hourly readings and all cells are gassing freely.

During charging, keep the electrolyte in each cell level with the coloured marker line by adding distilled water—NOT acid.

**PART B.**

**Routine Maintenance**

Every 1,000 miles (1.600 km.) or monthly, or more regularly in hot climates the battery should be cleaned as follows:—

Remove the battery cover and clean the battery top. Examine the terminals: if they are corroded scrape them clean and smear them with a film of petroleum jelly, or with a silicone grease.

The level of the electrolyte in each cell should be checked weekly or every 250 miles. Lift the battery out of the carrier so that the coloured filling line can be seen. Add distilled water until the electrolyte level reaches this line.

NOTE:—On NO account should the battery be topped-up above the COLOURED LINE.

With this type of battery, the acid can only be reached by a miniature hydrometer, which would indicate the state of charge.

Great care should be taken when carrying out these operations not to spill any acid or allow a naked flame near the electrolyte. The mixture of oxygen and hydrogen given off by a battery on charge, and to a lesser extent when standing idle, can be dangerously explosive.

The readings obtained from the battery electrolyte should be compared with those given in the table opposite. If a battery is suspected to be faulty it is advisable to have it checked by a Lucas depot or agent.

A lead/acid battery slowly loses its charge whilst standing—the rate of loss being greater in hot climates. If a battery is not being used, it is important to give it freshening charges at the appropriate recharge rate. These should be given fortnightly in temperate climates and weekly in the tropics.

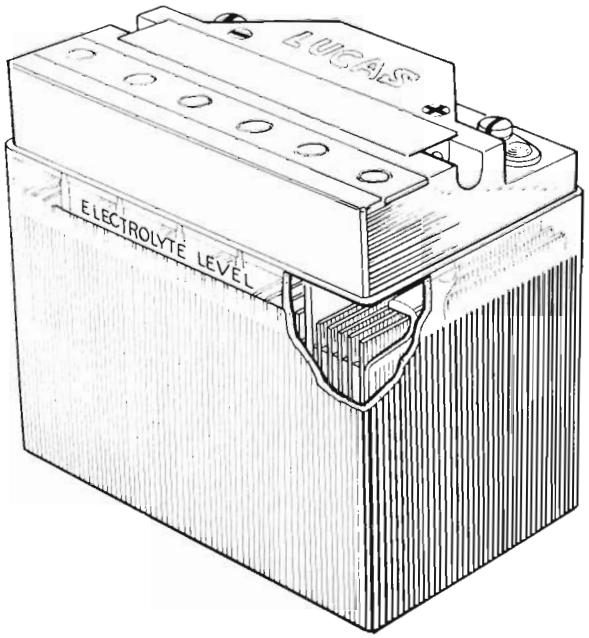


FIG. G.5. *The PUZ5A battery.*

**PART C.**

**Specific Gravity of Electrolyte for Filling the Battery.**

| U.K. and climates normally below 80°F. (26.6°C.) | | Tropical climates over 80°F. (26.6°C.) | |
|---|---|---|---|
| Filling | Fully charged | Filling | Fully charged |
| 1.260 | 1.270—1.290 | 1.210 | 1.210—1.230 |

To obtain a specific gravity strength of 1.260 at 60°F. (15.5°C.), add one part by volume of 1.840 specific gravity acid to 3.2 parts of distilled water.

To obtain a specific gravity strength of 1.210 at 60°F. (15.5°C.), add one part by volume of 1.840 specific gravity acid to 4.3 parts of distilled water.

PART D.

**Maximum Permissible Electrolyte Temperature During Charge**

| Climates normally below 80°F. (26.6°C.) | Climates frequently above 80°F. (26.6°C.) |
|---|---|
| 100°F. (38°C.) | 120°F. (49°C.) |

**Notes.**—The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60°F., which is adopted as a reference temperature. The method of correction is at as follows:—

For every 5°F. below 60°F. deduct .002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F., add .002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature. To take a temperature reading tilt the battery sideways and then insert the thermometer.

## COIL IGNITION SYSTEM

**Description**

The coil ignition system comprises an ignition coil, mounted below the petrol tank, and a contact breaker unit fitted in the timing cover. Apart from cleaning in-between the terminals, and checking the connections for soundness, the coil will not require any other attention. Testing the ignition coil is amply covered in Part C, page G.14, whilst testing the contact breaker is detailed in Part D.

The best method of approach to a faulty ignition system is to first check the low-tension circuit for continuity as shown in Part A, then follow the procedure laid out in Part B to locate the fault(s).

Failure to locate a fault in the low-tension circuit indicates that the high-tension circuit or sparking plug is faulty, and the procedure detailed in Part E must be adopted. Before commencing any of the following tests, however, the contact breaker and sparking plug gaps must be cleaned and adjusted to eliminate this possible source of fault.

PART A.

**Checking the Low-Tension Circuit for Continuity**

To check whether there is a fault in the low-tension circuit and to locate its position, the following tests should be carried out:—

First inspect the in-line fuse in the battery positive cable and replace if suspect, then connect an ammeter between the battery (—) and the ignition switch (+).

Turn the ignition on and slowly crank the engine. At the same time, observe the ammeter needle, which should fluctuate between zero and a slight discharge, as the contact breaker points open and close respectively.

If the ammeter needle does not fluctuate in the described way, then a fault in the low-tension circuit is indicated.

First, examine the contact breaker points for pitting, piling or presence of oxidation, oil or dirt, etc. Clean and ensure that the gap is set correctly to .015 in. (.381 mm.) as described on page B.19.

PART B.

**Fault Finding in the Low-Tension Circuit**

To trace a fault in the low-tension wiring, turn on the ignition switch and crank the engine until the contacts are opened, or alternatively, place a piece of insulating material between the contacts whilst the following test is carried out:—

For this test it is assumed that the wiring is fully connected as shown in the wiring diagram, page G.25. With the aid of a 0—15 volt D.C. voltmeter and two test-prods make a point to point check along the low-tension circuit starting at the battery and working right through to the ignition coil, stage by stage, in the following manner, referring to the relevant wiring diagram.

(1) First, establish that the battery is earthed correctly by connecting the voltmeter across the battery negative terminal and the machine frame earth. No voltage reading indicates that either the fuse has blown or that the red earthing lead is faulty. Also, a low reading would indicate a poor battery earth connection.

(2) Connect the voltmeter between the ignition coil (—) terminal and earth. No voltage reading indicates a breakdown between the battery and the coil (—) terminal, or that the switch connections are faulty.

(3) Connect the voltmeter between ignition switch "feed" terminal and earth. No reading indicates that the brown and white lead has faulty connections. Check for voltage at the brown/white lead connections at rectifier, and lighting switch terminals 2 and 10.

(4) Connect the voltmeter across ignition switch "load" terminal and earth. No reading indicates that the ignition switch is faulty and should be replaced. Battery voltage reading at this point but not at the ignition coil (—) terminal indicates that the white lead has become "open circuit" (broken or disconnected).

(5) Disconnect the black/white lead from the (+) terminal of the ignition coil. Connect the voltmeter across the (+) terminal of the coil and earth. No reading on the voltmeter indicates that the coil primary winding is faulty and a replacement ignition coil should be fitted.

(6) With the contact points open, reconnect the ignition coil lead and then connect the voltmeter across the contact points. No reading indicates that there is either a faulty connection or the internal insulation has broken down in the contact breaker condenser (capacitor).

If the condenser is suspected, then a substitution should be made and a retest carried out.

**PART C.**

**Ignition Coil**

The ignition coil consists of a primary and secondary winding, wound concentrically about a laminated soft iron core, the secondary winding being next to the core.

The primary and secondary windings of the coil have 310 turns and 17,000—17,600 turns respectively of enamel-covered wire, the secondary being much finer. Each layer is paper insulated from the next on both primary and secondary windings.

To test the ignition coil on the machine, first ensure that the low-tension circuit is in order as described in Part A, then disconnect the high-tension lead from the sparking plug. Turn the ignition switch to the IGN position and crank the engine until the contacts are closed.

Flick the contact breaker lever open a number of times whilst the high-tension lead from the ignition coil is held about $\frac{3}{16}$ in. away from the cylinder head. If the ignition coil is in good condition a strong spark should be obtained, if no spark occurs this indicates the ignition coil to be faulty.

Before a fault can be attributed to the ignition coil it must be ascertained that the high-tension cable is not cracked or showing signs of deterioration, as this may often be the cause of misfiring etc. It should also be checked that the ignition points are actually making good electrical contact when closed and that the moving contact is insulated from earth (ground) when open. It is advisable to remove the ignition coil and test it by the following method.

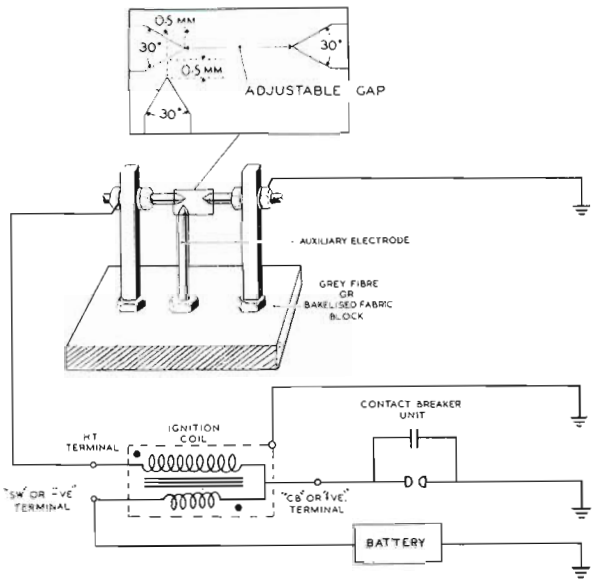


FIG. G.6. *Ignition coil test rig.*

**Bench Testing Ignition Coil**

Connect the ignition coil into the circuit shown in Fig. G.6 and set the adjustable gap to 9 mm. With the contact breaker running at 100 r.p.m., not more than 5% missing should occur at the spark gap over a period of 15 seconds. The primary winding can be checked for short-circuit coils by connecting an ohmeter across the low-tension terminals. The reading obtained should be within the figures quoted below (at 20°C.).

| Primary Resistance | |
|---|---|
| Minimum | Maximum |
| 3.0 ohms | 3.4 ohms |

**PART D.**

**Contact Breaker**

Faults occurring at the contact breaker are in the main due to, incorrect adjustments of the contacts or the efficiency being impaired by piling, pitting, or oxidation of the contacts due to oil etc. Therefore, always ensure that the points are clean and that the gap is adjusted to the correct working clearance as described on page B.19.

To test for a faulty condenser, first switch on the ignition, then take voltage readings across the contacts when open. No reading indicates that the condenser internal insulation has broken down. Should the fault be due to a condenser having a reduction in capacity, indicated by excessive arcing when in use, and overheating of the contact faces, a check should be made by substitution.

Particular attention is called to the periodic lubrication procedure for the contact breaker which is given on page A.11. When lubricating the parts ensure that no oil or grease gets on to the contacts.

If it is felt that the contacts require surface grinding then the complete contact breaker unit should be removed as described on page B.18, and the moving contact disconnected by unscrewing the securing nut from the condenser terminal. Grinding is best achieved by using a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a clean petrol (gasoline) moistened cloth. The contact faces should be slightly domed to ensure point contact. There is no need to remove the pitting from the fixed contact. When refitting the moving contact do not forget to refit the insulating shield to the condenser terminal and apply a smear of grease to the contact breaker cam and moving contact pivot post. Lubricate the felt pad.

**PART E.**

**Checking the High-Tension Circuit**

If ignition failure or misfiring occurs, and the fault is not in the low-tension circuit, then check the ignition coil as described in Part C. If the coil proves satisfactory, ensure that the high-tension cable is not the cause of the fault.

If a good spark is available at the high-tension cable, then the sparking plug suppressor cap or the sparking plug itself may be the cause of the fault. Clean the sparking plug and adjust the electrodes to the required setting as described on page G.17 and then reset the engine for running performance. If the fault re-occurs then it is likely that the suppressor cap is faulty and should be renewed.

### SPARKING PLUG

It is recommended that the sparking plug be inspected, cleaned and tested every 2,000 miles (3,200 km.) and a new one fitted every 10,000 miles (16,000 km.).

To remove the sparking plug a box spanner (13/16 in., 19.5 mm. across flats) should be used and if any difficulty is encountered a small amount of penetrating oil should be placed at the base of the sparking plug and time allowed for penetration.

Examine the plug for signs of petrol (gasoline) fouling. This is indicated by a dry, sooty, black deposit, which is usually caused by over-rich carburation, although ignition system defects such as a faulty contact breaker, coil or condenser defects, or a broken or worn out cable may be additional causes.

Examine the plug for signs of oil fouling. This will be indicated by a wet shiny, black deposit on the central insulator. This is caused by excessive oil in the combustion chamber during combustion and indicates that the piston rings or cylinder bore is worn.

To rectify this type of fault the above mentioned items should be checked with special attention given to carburation system.

Overheating of the sparking plug electrode is indicated by severely eroded electrode and a white, burned or blistered insulator. This type of fault can be caused by weak carburation or over-advanced ignition timing although plugs which have been operating whilst not being screwed down sufficiently can easily become overheated due to heat that is normally dissipated through to the cylinder head not having an adequate conducting path. Overheating is normally symptomised by pre-ignition, short plug life, and "pinking" which can ultimately result in piston crown failure. Unnecessary damage can result from over-tightening the plugs. To achieve a good seal between the plug and cylinder head, screw the plug in by hand on to its gasket, then lightly tighten with a box spanner.

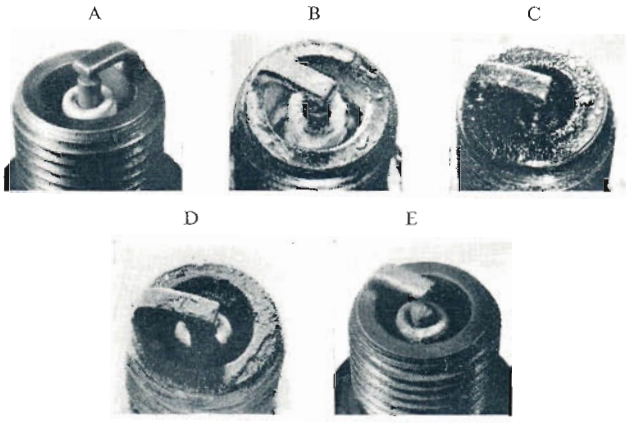


FIG. G.7. *Sparking plug diagnosis.*

A plug of the correct grade will bear a light flaky deposit on the outer rim and earth electrode, and these and the base of the insulator will be light chocolate brown in colour. A correct choice of plug is marked A. B shows a plug which appears bleached with a deposit like cigarette ash; this is too "hot-running" for the performance of the engine and a cooler-running type should be substituted.

A plug which has been running too "cold" and has not reached its self-cleaning temperature is shown at C. This has oil on the base of the insulator and electrodes, and should be replaced by a plug that will burn off deposits and remove the possibility of a short-circuit. The plug marked D is heavily sooted, indicating that the mixture has been too rich, and a further carburation check should be made. At illustration E is seen a plug which is completely worn out and in need of replacement.

To clean the plug it is preferable to make use of a properly designed proprietary plug cleaner. The makers instructions for using the cleaner should be followed carefully.

When the plug has been carefully cleaned, examine the central insulator for cracking and the centre electrode for excessive wear. In such cases the plug will have completed its useful life and a new one should be fitted.

Finally, the sparking plug electrode should be adjusted to the correct gap setting of .025 in. (.635 mm.). Before refitting sparking plug the threads should be cleaned by means of a wire brush and a minute amount of graphite grease smeared on to the threads. This will prevent any possibility of thread seizure occurring.

If the ignition timing and carburation settings are correct and the plug has been correctly fitted, but overheating still occurs, then it is possible that carburation is being adversely affected by an air leak between the carburetter and the cylinder head. This possibility must be checked thoroughly before taking any further action. When it is certain that none of the above mentioned faults are the cause of overheating then the plug type and grade should be considered.

Normally the type of plug quoted in General Data is satisfactory for general use of the machine, but in special isolated cases, conditions may demand a plug of a different heat range. Advice is readily available to solve these problems from the plug manufacturer who should be consulted.

## CHARGING SYSTEM

### Description

The alternator gives "maximum" output with the lighting switch in all switch positions, the coils being permanently connected across the rectifier. Excessive charge is absorbed by the Zener Diode which is connected in parallel with the battery.

**Always ensure that the ignition switch is in the OFF position whilst the machine is not in use.**

Proceed to test the alternator as described in Part A. If the alternator is satisfactory, the fault must lie in the charging circuit, hence the rectifier must be checked as given in Part B and then the wiring and connections as shown in Part C.

**PART A.**

### Checking the Alternator Output

Disconnect the three alternator output cables and run the engine at 3,000 r.p.m.

Connect an A.C. voltmeter (0—15 volts) with 1 ohm load resistor in parallel with each of the alternator leads in turn as shown in the table, on page G.24, and observe the voltmeter readings. A suitable 1 ohm load resistor can be made from a piece of nichrome wire as shown in Part D, page G.20.

The test is conducted by connecting a voltmeter and the 1 ohm load resistor between the following cables and note the readings:—

(*a*) White/green and green/black cables—voltmeter should read 4.0 volts (minimum).

(*b*) White/green and green/yellow cables—voltmeter should read 6.5 volts (minimum).

(*c*) White/green and joined green/black and green/yellow cables—voltmeter should read 8.5 volts (minimum).

From the results obtained, the following deductions can be made:—

(1) If the readings are all equal to or higher than those quoted then the alternator is satisfactory.

(2) A low reading on any group of coils indicates either that the leads concerned are chafed or damaged due to running on the chains or that some turns of the coils are short-circuited.

(3) Low reading for all parts of the test indicate that either the green/white lead has become chafed or damaged due to rubbing on the chains or that the rotor has become partially demagnetised. As the latter is an extremely rare occurrence it is advisable to check by substitution before returning the rotor to the manufacturer for re-magnetisation. If it is found that the rotor has become demagnetised, check that it has not been caused by a faulty rectifier and that the battery is of correct polarity.

(4) A zero reading for any group of coils indicates that a coil has become disconnected, is open-circuit, or is earthed.

(5) A reading obtained between any one lead and earth indicates that coil windings or connections have become earthed.

If any of the above mentioned faults occur, always check the stator leads for possible chain damage before attempting repairs or renewing the stator.

It is beyond the scope of this manual to give instruction for the repair of faulty stator windings. However, the winding specification is given in the table, on page G.24 for those obliged to attempt repair work.

The encapsulated alternator on 1968 Victor Specials cannot be rewound.

**PART B.**

**Rectifier Maintenance and Testing**

The rectifier is a silicon semi-conductor device which allows current to flow in one direction only. It is connected to provide full wave rectification of alternator output current.

The rectifier requires no maintenance beyond checking that the connections are clean and tight. The nuts clamping the rectifier plates together must not under any circumstances be slackened. A separate nut is used to secure the rectifier to the back of the toolbox and it is important to check periodically that the rectifier is firmly attached.

When tightening the rectifier securing nut, hold the spanner as shown in Fig. G.8 for if the plates are twisted, the internal connections will be broken. Note the circles marked on the fixing bolt and nut indicating that the thread form is U.N.F.

**Testing the Rectifier**

To test the rectifier, first disconnect the brown/white lead from the rectifier centre terminal and insulate the end of the lead to prevent any possibility of a short-circuit occurring, and then connect a D.C. voltmeter (with 1 ohm load resistor in parallel) between the rectifier centre terminal and earth.

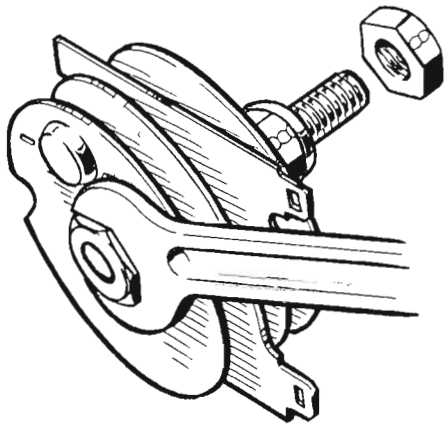

FIG. G.8. *Refitting the rectifier.*

NOTE:—Voltmeter positive terminal to frame earth (ground) and negative terminal to centre terminal on rectifier.

Ensure that all the temporary connections are well insulated to prevent a short-circuit occurring then turn the ignition switch to IGN position and start the engine.

With the engine running at approximately 3,000 r.p.m. observe the voltmeter readings. The reading obtained should be at least 7.5 volt minimum.

(1) If the reading is equal to or slightly greater than that quoted, then the rectifier elements in the forward direction are satisfactory.

(2) If the reading is excessively lower than the figures given, then check the rectifier earthing bolt connection. If the connection is good then a replacement rectifier should be fitted.

(3) If the reading is lower than the figures quoted or zero readings are obtained, then the rectifier or the charging circuit wiring is faulty and the rectifier should be disconnected and bench tested so that the fault can be located.

Note that all the previous conclusions are made with the assumption that the alternator A.C. output figures were satisfactory. Any fault at the alternator will, of course, reflect on the rectifier test results. Similarly any fault in the charging circuit wiring may indicate that the rectifier is faulty. The best method of locating a fault is to disconnect the rectifier and bench test it as shown below.

**Bench Testing the Rectifier**

For this test the rectifier should be disconnected and removed. Before removing the rectifier, disconnect the leads from the battery terminals to avoid the possibility of a short-circuit occurring.

Connect the rectifier to a fully charged 12 volt battery of approximately 40 ampere/hours capacity at the 10 hour rate, and 1 ohm load resistor, and then connect the D.C. voltmeter in the V2 position, as shown in Fig. G.10.

Note the battery voltage (should be 12 volt) and then connect the voltmeter in V1 position whilst the following tests are conducted.

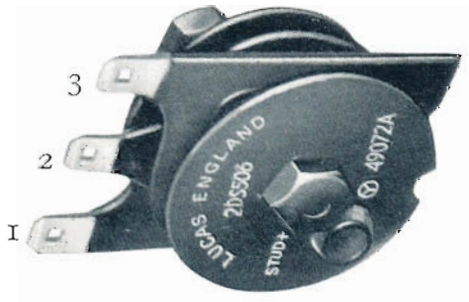


FIG. G.9. *The rectifier showing terminal connections.*

A voltmeter in position V1 will measure the volt drop across the rectifier plate. In position V2 it will measure the supply voltage to check that it is the recommended 12 volts on load.

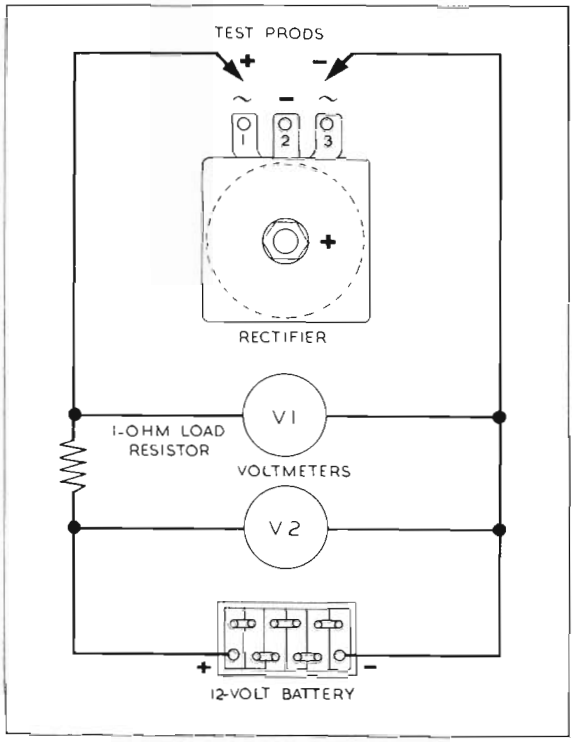


FIG. G.10. *Bench testing the rectifier.*

In Fig. G.11, the rectifier terminal markings 1, 2 and 3 are as shown physically in Figs G.9 and G.10, while terminal 4 represents the rectifier centre bolt. 1 and 3 are the A.C. input terminals while 2 and 4 are the D.C. output terminals (—ve and +ve respectively).

TEST 1

With the test leads, make the following connections but keep the testing time as short as possible to avoid overheating the rectifier cell: (A) 1 and 2, (B) 1 and 4, (C) 3 and 4, (D) 3 and 2. Each reading should not be greater than 1.5 volts with the battery polarity as shown.

TEST 2

Reverse the leads or battery polarity and repeat Test 1. The reading obtained should be the same as the battery voltage (V2).

If the readings obtained are not within the figures given, then the rectifier internal connections are shorting or aged and the rectifier should be renewed.

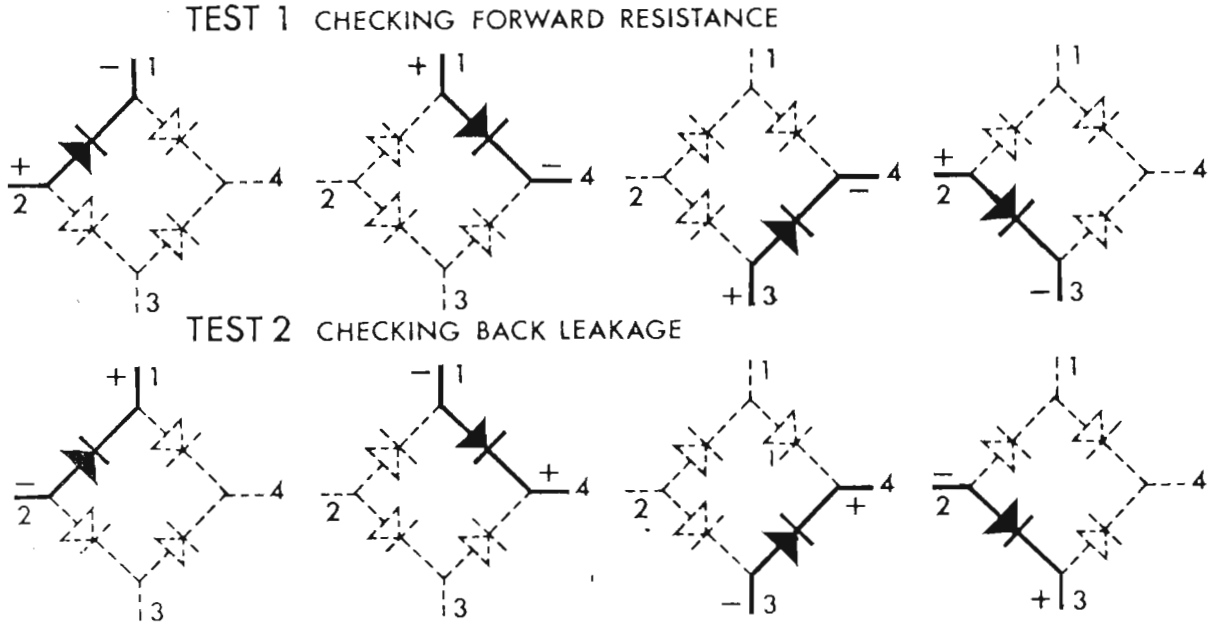


FIG. G.11. *Rectifier test sequence.*

**PART C.**

**Checking the Charging Circuit for Continuity**

This test utilises the machine's own battery to test for continuity or breakdown in the A.C. section of the charging system.

The battery must be in a good state of charge and the alternator leads must be disconnected at the snap connectors so that there is no possibility of demagnetising the rotor.

First, check that there is voltage at the rectifier centre terminal by connecting a D.C. voltmeter, with 1 ohm load resistor in parallel, between the rectifier centre terminal and earth, remember (+ve) positive earth (ground). The voltmeter should read battery volts. If it does not, there is a faulty connection in the wiring and test 1, 3 and 4 in Part B, page G.14, should be carried out to locate the fault.

**PART D.**

**Constructing a 1 ohm Load Resistor**

The resistor used in the following tests must be accurate and constructed so that it will not overheat otherwise the correct values of current or voltage will not be obtained.

A suitable resistor can be made from 4 yards (3¾ metres) of 18 s.w.g. (.048 in., i.e., 1.2 mm. diameter) nichrome wire by bending it into two equal parts and calibrating it as follows:—

(1) Fix a heavy gauge flexible lead to the folded end of the wire and connect this lead to the positive terminal of a 6 volt battery.

(2) Connect a D.C. voltmeter (0—10 volts) across the battery terminals and an ammeter (0—10 amp.) between the battery negative terminal and the free ends of the wire resistance, using a crocodile clip to make the connection.

(3) Move the clip along the wires, making contact with both wires until the ammeter reading is numerically equal to the number of volts shown in the voltmeter. The resistance is then 1 ohm. Cut the wire at this point, twist the two ends together and wind the wire on an asbestos former approximately 2 in. (5 cm.) diameter so that each turn does not contact the one next to it.

## ZENER DIODE CHARGE CONTROL

**Description**

The Zener Diode output regulating system which uses the coils of the alternator connected permanently across the rectifier, provides automatic control of the charging current. It will only operate successfully on a 12 volt system where it is connected in parallel with the battery as shown in the wiring diagram, page G.25.

Assuming the battery is in a low state of charge its terminal voltage (the same voltage is across the Diode) will also be low, therefore the maximum charging current will flow into the battery from the alternator. At first none of the current is by-passed by the Diode becasuse of it being non-conducting due to the low battery terminal volts. However, as the battery is quickly restored to a full state of charge, the system voltage rises until at 14 volts the Zener Diode becomes partially conducting. thereby providing an alternative path for a small part of the charging current. Small increases in battery voltage result in large increases in Zener conductivity until, at approximately 15 volts about 5 amperes of the alternator output is by-passing the battery. The battery will continue to receive only a portion of the alternator output as long as the system voltage is relatively high.

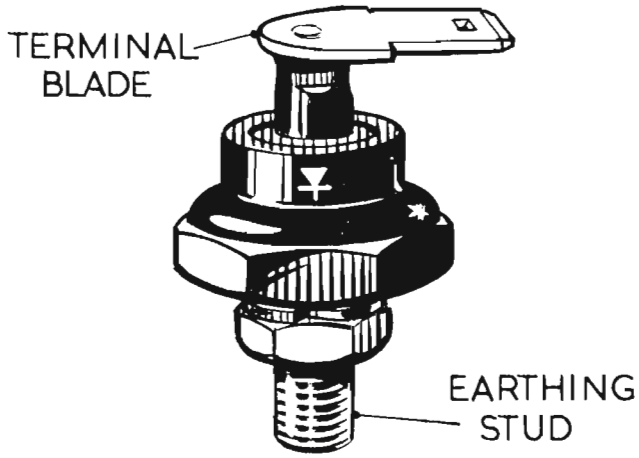


FIG. G.12. *Zener Diode.*

Depression of the system voltage, due to the use of headlamp or other lighting equipment, causes the Zener Diode current to decrease and the balance to be diverted and consumed by the component in use.

If the electrical loading is sufficient to cause the system voltage to fall to 14 volts, the Zener Diode will revert to a high resistance state of non-conductivity and the full generated output will go to meet the demands of the battery.

**PART A.**

**Maintenance**

The Zener Diode is mounted on a finned aluminium heat sink below the bottom yoke of the steering head. Providing the Diode and the heat sink are kept clean, and provided with an adequate airflow, to ensure maximum efficiency, no maintenance will be necessary.

The "earthing" stud which secures the Diode to the heat sink, must not be subjected to a tightening torque greater than figures quoted on page H.1. The earth wire must be fitted under the fixing nut, NOT between the Diode and heat sink.

**PART B.**

**Checking Performance of Zener Diode**

The following procedure enables the Zener Diode to be tested on the machine. Only suitably calibrated first-grade moving coil instruments should be used.

NOTE:—It is essential that the battery is in good condition and in reasonably good state of charge. If the battery condition is uncertain, it should be temporarily replaced by a good battery for this test.

(1) Withdraw the cable from the Zener Diode terminal blade.

(2) Connect a suitable ammeter between the end of the cable removed and the Zener Diode terminal blade, using a suitable jumper lead. *N.B.*—The ammeter red or positive lead must be connected to the Zener Diode.

(3) Connect a suitable voltmeter between the Zener Diode terminal blade and the heat sink. *N.B.*—The voltmeter red or positive lead must be connected to the heat sink.

(4) Check that all lights are switched off.

(5) Start the engine and gradually increase the speed while observing both meters:—

(*a*) When the voltage across the Zener Diode reaches 12.75 volts, the Zener current ammeter must indicate zero.

(*b*) Increase engine speed until a Zener current of 2 amperes is indicated on the ammeter. At this value, a satisfactory Zener Diode should cause a reading on the volmeter of between 13.5 and 15.5 volts.

(6) If the Zener current ammeter in test (*a*) registers any current at all before the Zener voltmeter indicates a voltage of 12.75 volts across the Zener, then a replacement Zener Diode must be fitted.

If test (*a*) proves satisfactory but in test (*b*) a higher voltage than that stated is registered on the voltmeter, before the Zener current ammeter registers 2 amperes, then a replacement Zener Diode must be fitted.

## ELECTRIC HORN

**Description**

The horn is of a high frequency single-note type and is operated by direct current from the battery. The method of operation is that of a magnetically operated armature, which impacts on the core face, and causes the tone disc of the horn to vibrate. The magnetic circuit is made self-interrupting by contacts which can be adjusted externally.

If the horn fails to work, check the mounting bolts etc., and horn connection wiring. Check the battery for state of charge. A low supply voltage at the horn will adversely effect horn performance. If the above checks are made and the fault is not remedied, then adjust the horn as follows.

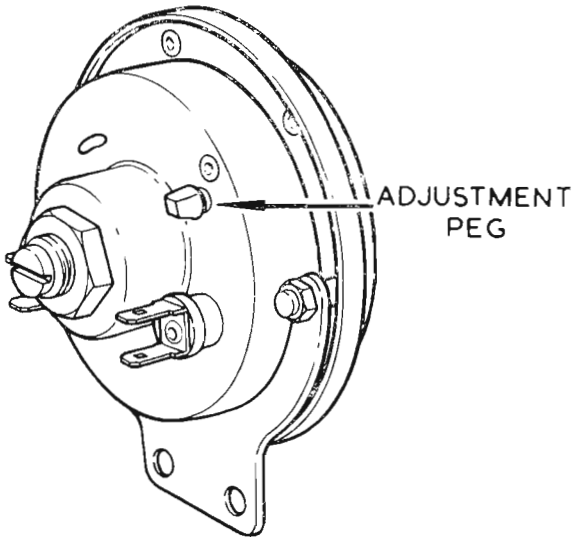


FIG. G.13.

**Horn Adjustment**

When adjusting and testing the horn do not depress the horn push for more than a fraction of a second or the circuit wiring may be overloaded.

A small adjustment peg situated near the terminals (see Fig. G.13) is provided to take up wear in the internal moving parts of the horn. To adjust, turn this peg anti-clockwise until the horn just fails to sound, and then turn it back (clockwise) about one-quarter to half a turn.

## HEADLAMP

**Description**

The headlamp is of the pre-focus bulb light unit type and access is gained to the bulb and bulb holder by withdrawing the rim and light unit assembly. To do this slacken the screw at the top of the headlamp shell just behind and adjacent to the rim and prise off the rim and light unit assembly.

The bulb can be removed by first pressing the cylindrical adapter inwards and turning it anti-clockwise. The adapter can then be withdrawn and the bulb is free to be removed.

When fitting a new bulb, note that it locates by means of a cut-away and projection arrangement. Also note that the adapter can only be replaced one way, the tabs being staggered to prevent incorrect reassembly. Check the replacement bulb voltage and wattage specification and type before fitting.

Focusing with this type of unit is unnecessary and there is no provision for such.

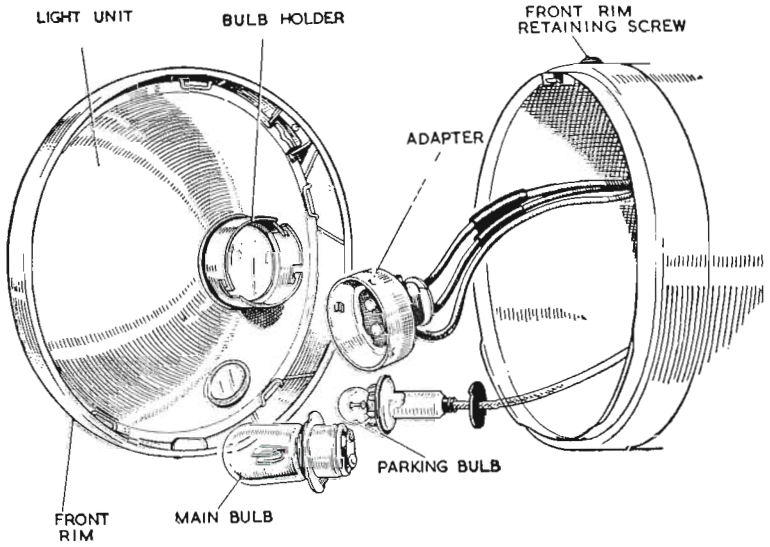


FIG. G.14. *Headlamp dismantled.*

**Beam Adjustment**

When the motor-cycle carries its normal load, the headlamp full-beam should project straight ahead and parallel with the road surface.

To achieve this, place the machine on a level road pointing towards a wall at a distance of 25 feet away, with a rider and passenger, on the machine, slacken the two headlamp fixing bolts at either side and tilt the beam unit until the beam is focused as indicated in Fig. G.15. Do not forget that the headlamp should be on "full beam" lighting during this operation. Tighten the bolts fully after adjustment.

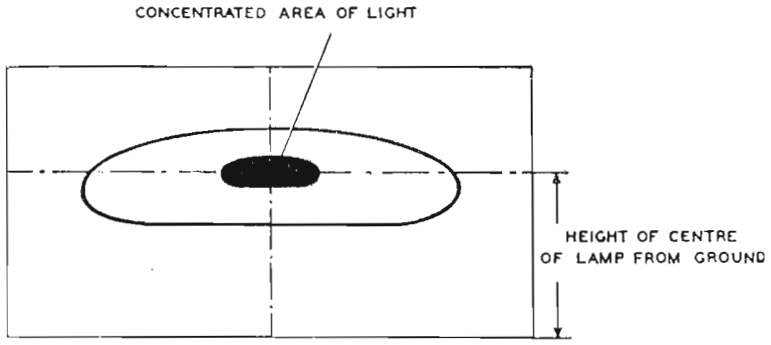


FIG. G.15. *Beam adjustment.*

### TAIL AND STOP LAMP UNIT

Access to the bulb in the tail and stop lamp unit is achieved by unscrewing the two slotted screws which secure the lens. The bulb is of the double filament offset pin type and when a replacement is carried out, ensure that the bulb is fitted correctly. Check that the two supply leads are connected correctly and check the earth (ground) lead to the bulb holder is in satisfactory condition.

When refitting the lens, do not over-tighten the fixing screws or the lens may fracture as a result.

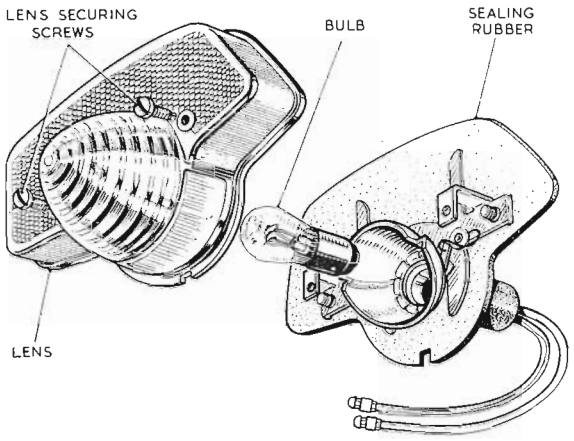


FIG. G.16. *Stop and tail lamp dismantled.*

### OTHER LIGHT UNITS

The headlamp shell contains the ignition warning light and the parking light, access being gained to each of them by first removing the rim and light unit assembly.

The speedometer light is housed within the base of the speedometer head.

Each bulb holder is a push-fit into its respective component, and the bulbs are located by means of a peg arrangement, except for the speedometer light which has a screw type bulb.

### ALTERNATOR—ADDITIONAL INFORMATION

**Specifications and Output Figures**

| Stator No. | System Voltage | Alternator Output Minimum A.C. Volts at 3,000 r.p.m. | | | Stator Coil Details | | |
|---|---|---|---|---|---|---|---|
| | | A | B | C | No. of Coils | Turns Per Coil | S.W.G. |
| 47162 | 12 volt | 4.0 | 6.5 | 8.5 | 6 | 140 | 22 |
| †47205 | 12 volt | — | 9.0 | — | Not applicable | | |

A—White/green and green/black.

B—White/green and green/yellow.

C—White/green and green/black—green/yellow connected.

†Applicable to 1968 Victor Special.

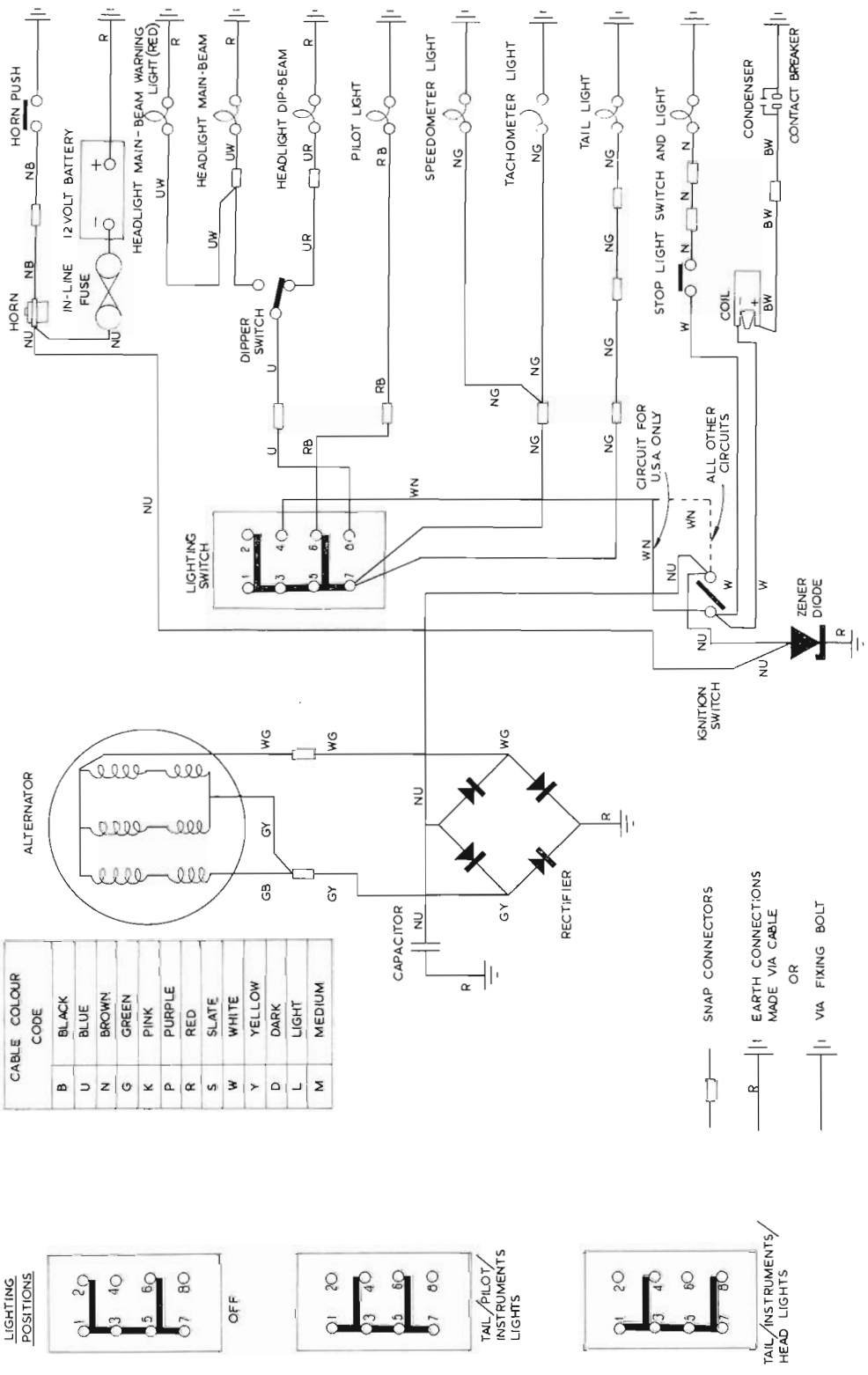


FIG. G.17. *Wiring diagram* (1968).

The following are the recommended torque wrench settings for critical nuts and bolts used on B44 Victor models.

| Application | Thread Dia. and Type | T.P.I. | Hex. (A/F) | Torque (lb./ft.) |
|---|---|---|---|---|
| Carburetter flange nuts (SL) .... | 0.3125″ B.S.C. | 26 | 0.525″ | 10 |
| Clutch centre nut .... .... | 0.500″ B.S.C. | 20 | 0.820″ | 60/65 |
| Crankpin nuts .... .... .... | 0.875″ W.F. | 20 | 1.480″ | 200 |
| Crankshaft pinion nut .... .... | 0.625″ B.S.F. | 20 | 0.919″ | 35/40 |
| Cylinder barrel nut .... .... | 0.4375″ B.S.C. | 20 | 0.600″ | 30/33 |
| Cylinder head stud nut .... .... | 0.3125″ B.S.C. | 26 | 0.525″ | 18/20 |
| Kickstart ratchet nut .... .... | 0.500″ B.S.C. | 20 | 0.705″ | 50/55 |
| Oil pump stud nuts .... .... | 0.250″ B.S.C. | 26 | 0.445″ | 5/7 |
| Rotor fixing nut .... .... .... | 0.625″ B.S.C. | 20 | 1.010″ | 60 |
| Valve cover nuts .... .... .... | 0.3125″ B.S.C. | 26 | 0.525″ | 10 |
| Valve cover nuts .... .... .... | 0.250″ B.S.C. | 26 | 0.440″ | 5/7 |
| Front fork cap nuts .... .... | 1.0625″ W.F. | 20 | 1.300″ | 50/55 |
| Front fork bottom yoke nuts .... | 0.375″ U.N.F. | 24 | 0.562″ | 23/25 |

*Abbreviations:*

| | | |
|---|---|---|
| T.P.I. | — | Threads Per Inch. |
| HEX. A/F | — | Hexagon Across Flats. |
| SL | — | Self-locking. |
| B.S.C. | — | British Standard Cycle. |
| B.S.F. | — | British Standard Form. |
| U.N.F. | — | Unified Fine. |
| W.F. | — | Whitworth Form. |
| L.H.T. | — | Left Hand Thread. |

## INDEX

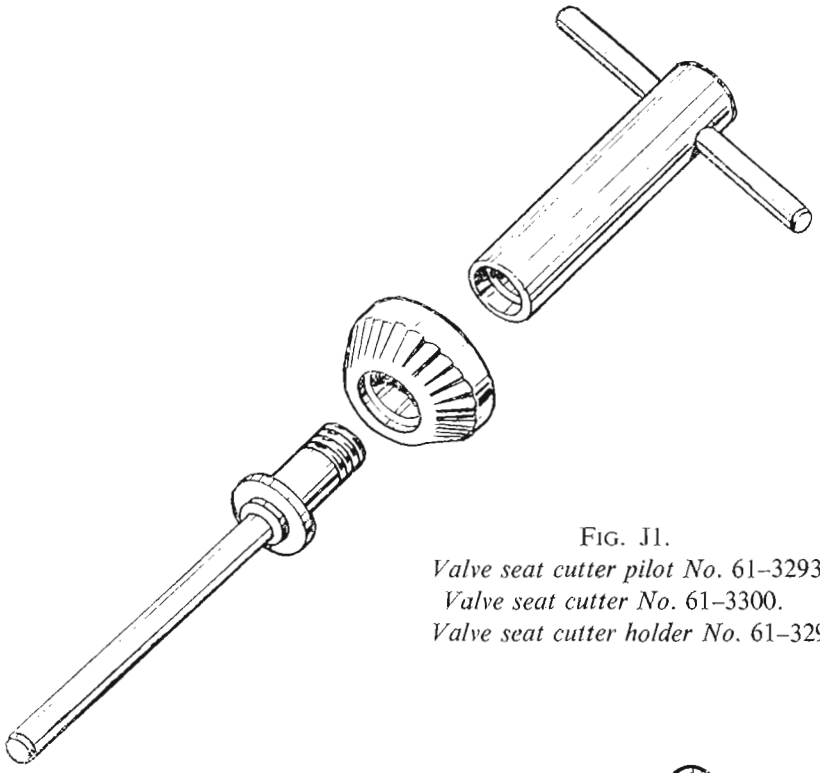

FIG. J1.
*Valve seat cutter pilot No.* 61–3293.
*Valve seat cutter No.* 61–3300.
*Valve seat cutter holder No.* 61–3290.

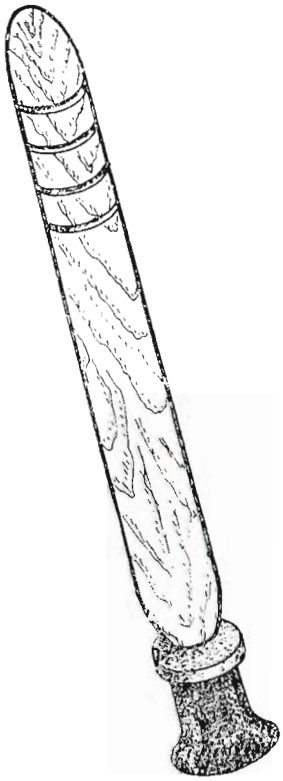

FIG. J.2.
*Valve grinding tool No.* 65–9240.

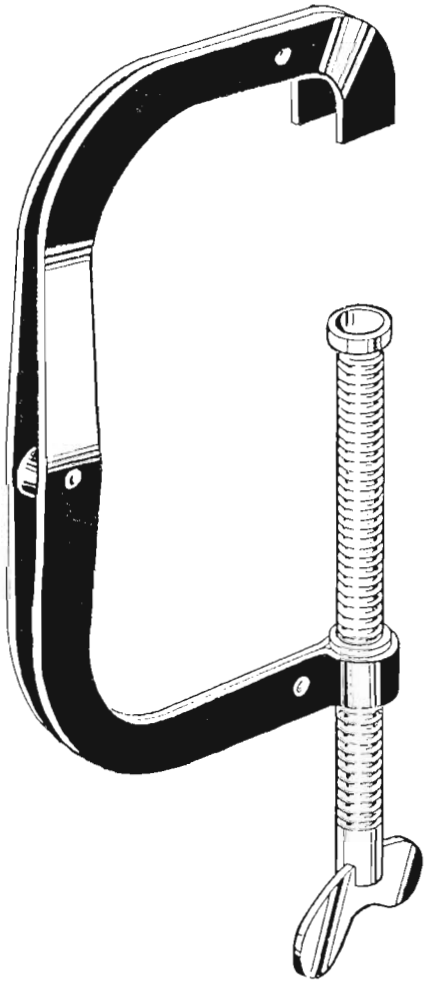

FIG. J.3.
*Valve spring compressor No.* 61–3340.

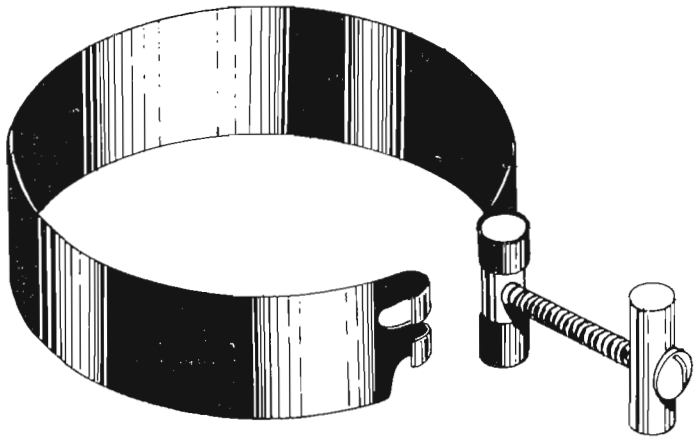

FIG. J.4.
*Piston ring slipper* (75–80 *mm.*)
*No.* 61–3707

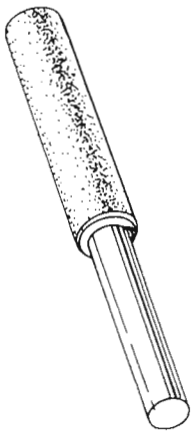

FIG. J.5.
*Valve guide fitting and extracting punch No.* 61–3382.

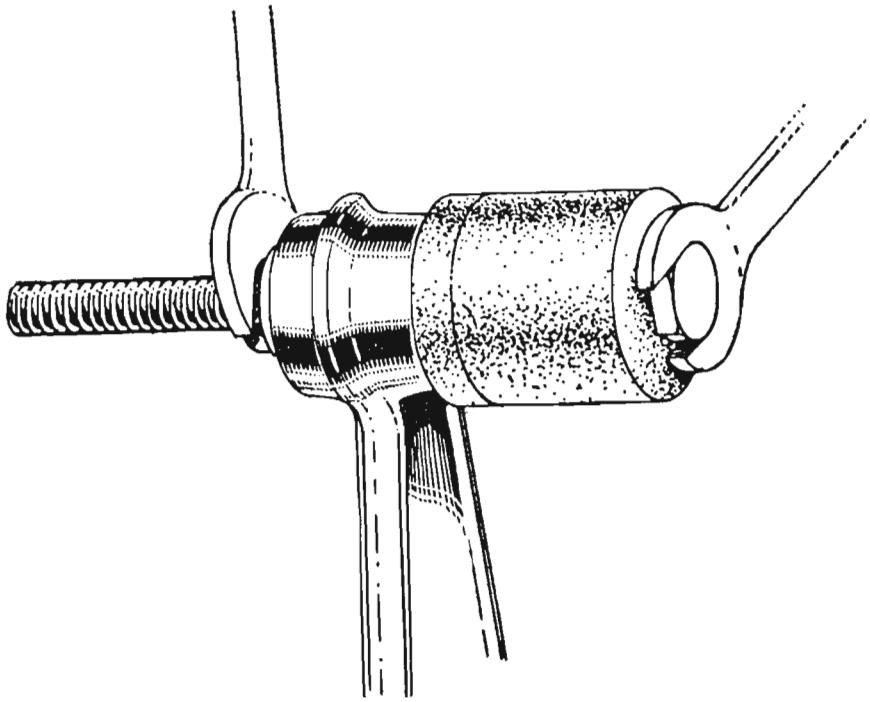

FIG. J.6.
*Small-end bush extractor No.* 61–3653.

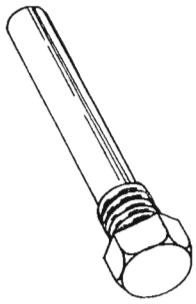

FIG. J.7.
*Contact breaker cam removal tool for* 4*CA Contact breaker No.* 61–3761.

*Contact breaker cam removal tool for* 4*CA and* 6*CA Contact breaker No.* 61–3816.

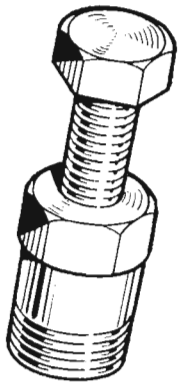

FIG. J.8.
*Clutch sleeve extractor No.* 61–3583.

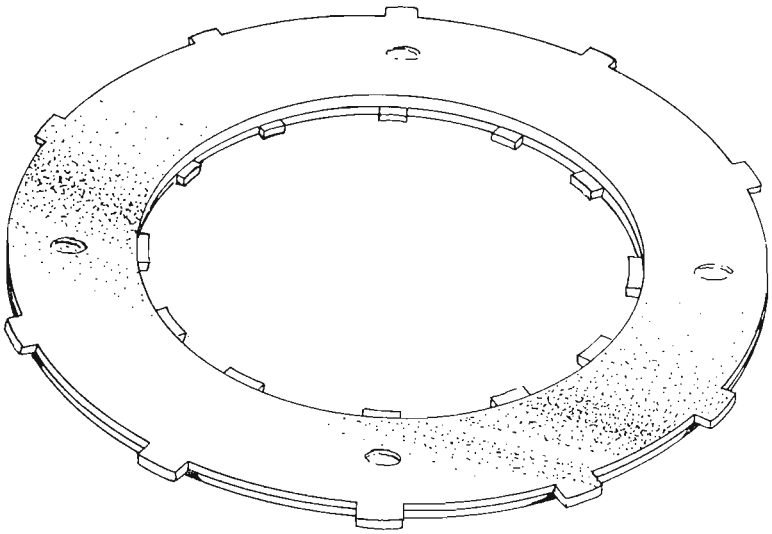

FIG. J.10.
*Clutch locking tool No.* 61–3774.

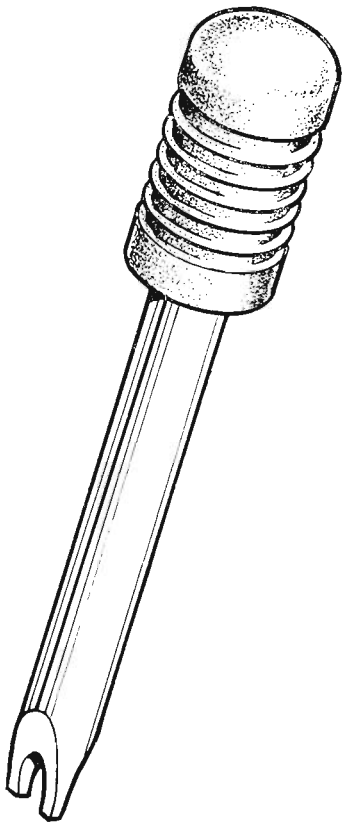

FIG. J.9.
*Clutch nut screwdriver No.* 61–3700.

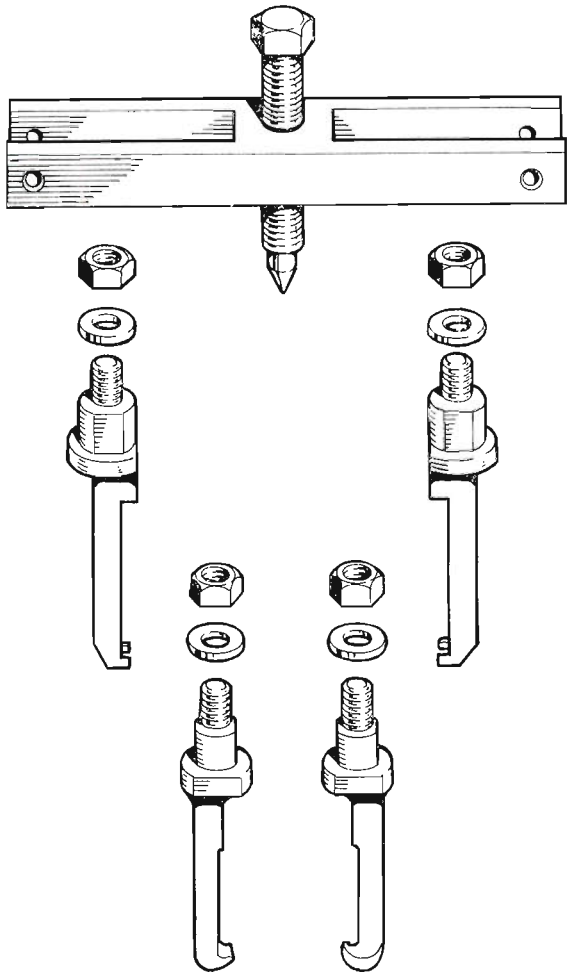

FIG. J.11.
*Pinion extractor set No.* 61–3773.

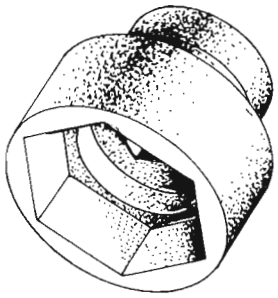

FIG. J.12.
*Crankpin nut socket*
*No.* 61–3770

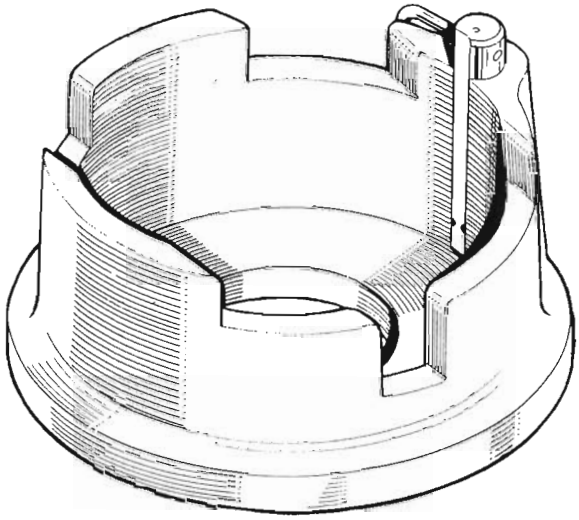

FIG. J.13.
*Flywheel bolster*
*No.* 61–3771.

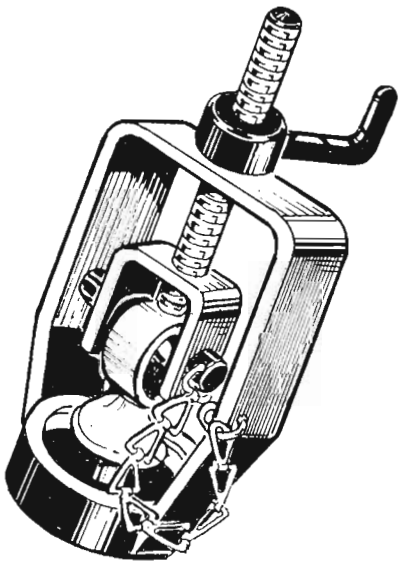

FIG. J.14.
*Rear damper dismantling and assembly tool No.* 61–3503.

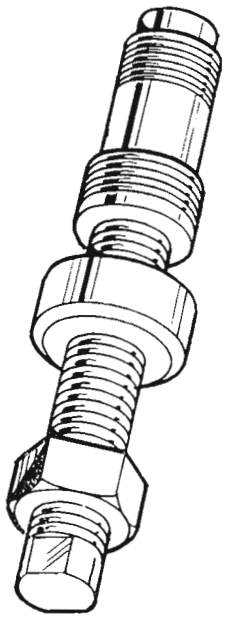

FIG. J.15.
*Fork leg removal and assembly tool No.* 61–3350.

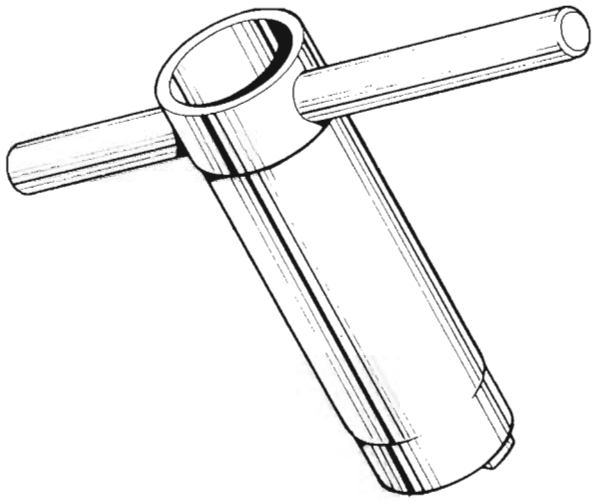

FIG. J.16.
*Fork oil seal holder removal tool No.* 61–3005.

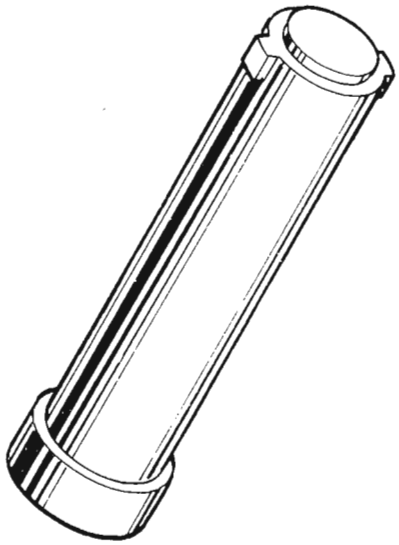

FIG. J.17.
*Fork oil seal extractor No.* 61–3006.

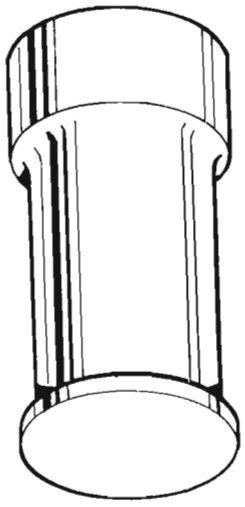

FIG. J.18.
*Fork oil seal assembly tool No.* 61–3007.

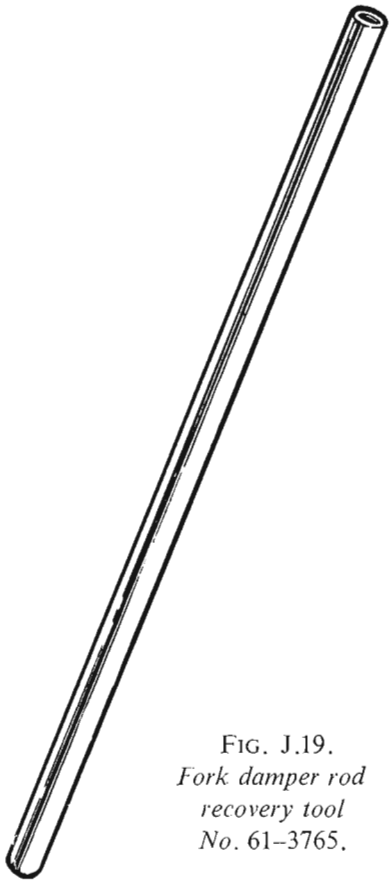

FIG. J.19.
*Fork damper rod recovery tool No.* 61–3765.

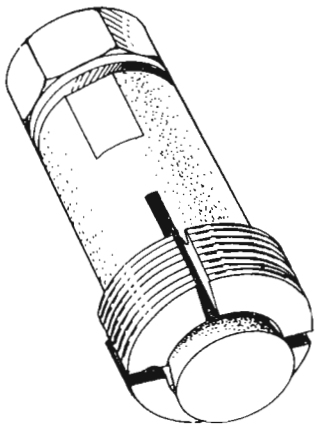

FIG. J.20.
*Steering head cup extractor No.* 61–3063.

## INDEX

## INCHES TO MILLIMETRES — 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 | .762 |
| .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 |

## 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 |

| 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 |

## DRILL SIZES

| 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 & 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.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. | PITCH DIAMETER NUT MIN. | PITCH DIAMETER BOLT MAX. | PITCH DIAMETER 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 | 1.1789 | 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.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. | PITCH DIAMETER NUT MIN. | PITCH DIAMETER BOLT MAX. | PITCH DIAMETER 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 | | 1.196 | 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.C. SCREW THREADS

| DIA. OF BOLT (INCH) | THDS. PER INCH | | PITCH (INCH) | DEPTH OF THREAD (INCH) | BASIC DIAMETERS (INCH) | | |
|---|---|---|---|---|---|---|---|
| | NORMAL SERIES | 20 T.P.I. SERIES | | | MAJOR | EFFECTIVE | MINOR |
| 1/8 | 40 | | 0.02500 | 0.0133 | 0.1250 | 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. | PITCH DIAMETER NUT MIN. | PITCH DIAMETER BOLT MAX. | PITCH DIAMETER 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 | .039 |
| 15 | .0354 | 120.5 | .0260 | .0250 | .0005 | | | | | .061 | .07 | .035 |
| 16 | .0311 | 133.3 | .0225 | .0220 | .0004 | | | | | | | |

## 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 |

## 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 | 68.189 | 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 |

## PINTS TO LITRES

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| — | — | .568 | 1.136 | 1.705 | 2.273 | 2.841 | 3.410 | 3.978 | 4.546 |
| ¼ | .142 | .710 | 1.279 | 1.846 | 2.415 | 2.983 | 3.552 | 4.120 | 4.688 |
| ½ | .284 | .852 | 1.420 | 1.989 | 2.557 | 3.125 | 3.694 | 4.262 | 4.830 |
| ¾ | .426 | .994 | 1.563 | 2.131 | 2.699 | 3.267 | 3.836 | 4.404 | 4.972 |

## 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 |

## 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 |

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