TRIUMPH

Spitfire 4

STAGE TUNING
AND
COMPETITION PREPARATION

TRIUMPH

Spitfire 4

COMPETITION PREPARATION AND STAGE TUNING

incorporating

HERALD MODELS

Issued by

STANDARD-TRIUMPH SALES LTD.,
COVENTRY, ENGLAND

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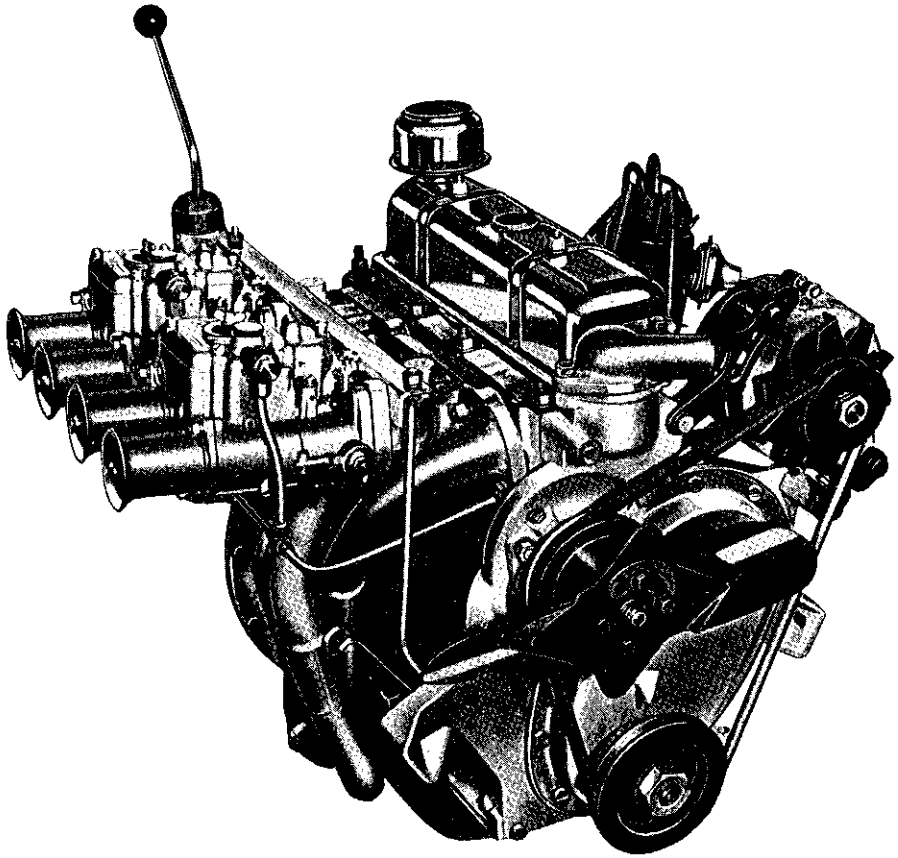


Fig. 1. Spitfire 4 engine converted to Stage II tune

FOREWORD

Since the introduction of the Spitfire 4, there has been an increasing demand for improved engine performance to assist owners when participating in competition events. To meet this demand, Standard-Triumph engineers have undertaken considerable re-development work which has enabled them to increase the power of the Spitfire engine unit and to make available the following two stages of tune. Each stage involves the use of all components listed under the appropriate heading on pages 13, 19 and 20.

The "Interim Stage", giving 70 b.h.p., requires very little modification to a basic engine, the differences being confined primarily to the fitting of a Solex compound carburettor with aluminium inlet manifold, a four-branch exhaust system and raising the compression ratio to 9·75 : 1.

The "Stage II" tune is an extremely comprehensive racing conversion which makes possible a power output of 90 b.h.p. approximately. This is achieved by using a four-port cylinder head of 10·5 : 1 compression ratio with two Weber carburettors, a modified camshaft and a four-branch exhaust manifold. When making this conversion, serious consideration should be given to the instructions made in the text regarding the use of a stronger crankshaft, pistons and connecting rods, diaphragm clutch and a modified gearbox.

Being supplementary to the Workshop Manual, which should be used when general data, special tools, nut tightening torque and detailed dismantling and assembly procedures are required, the content of this booklet is confined to listing new data, homologated parts, and to explaining the additional work and preparation necessary for achieving the best results from the kits. Notes on additional items of equipment and special processes are given under "Optional Recommendations".

The Workshop Manual, Part No. 511243, retails at £3 3s. 0d. and may be obtained from Standard-Triumph Distributors or Dealers. Parts and Manuals are not obtainable direct from the factory.

Selection of Modified Parts

The Spitfire model specification in standard tune provides a sports car with outstanding reliability and performance. It is generally accepted, however, that any increase in performance in excess of manufacturer's standard specification will result in increased wear rate and induce additional stresses in all mechanical components, resulting in a shorter working life. It is suggested, therefore, that owners contemplating increasing the performance of their models select the simplest form of tune which meets their requirements.

Conditions of Sales

Standard-Triumph Sales Limited reserve the right to vary, at any time, the prices quoted. All goods are invoiced at prices current at the time of purchase and do not include fitting charges.

The descriptions and illustrations appearing in this book are not binding. The MANUFACTURER, therefore, reserves the right—whilst retaining the basic features of the Models herein described and illustrated to make at any time, without necessarily bringing this book up-to-date, any alteration to units, parts or accessories deemed convenient for improvement or for any manufacturing or commercial reason.

CONTENTS

HOMOLOGATION

General

Because of frequent changes in the regulations governing motor sport, any private owner who wishes to modify his car prior to participating in serious competition events should first contact the Standard-Triumph Competition Department.

All items mentioned in this booklet, unless otherwise stated, are homologated, that is, eligible for use in competitions approved by the "Federation Internationale de L'Automobile" (F.I.A.).

Triumph Spitfire (1964)

The new "four-port cylinder head" included in the "Stage II Conversion", differs from the normal production item. Therefore, all Spitfires from Chassis No. FC1, when built to Stage II Tune, are homologated as an entirely different model. This has been titled the "Triumph Spitfire (1964)" to differentiate it from the normal production model.

The rules of the F.I.A. permit the use of any of the following additional items of equipment without the need of homologation:

1. Stage II gearbox conversion, with or without Overdrive.
2. 4½J wide rim wheels (Steel or Alloy).
3. Competition brake materials.
4. Brake booster of any make.
5. Oil cooler.
6. Competition suspension.
7. Competition shock absorbers.

Triumph Spitfire 4

A normal production Spitfire 4 can be fitted with any of the aforementioned items numbered 1 to 7 without the need of homologation.

Triumph Herald 1200 Range

Under F.I.A. rules, homologation requirements for touring cars differ from those for sports cars. A normal production Triumph Herald 1200, therefore, may be fitted with any of the following items:

1. 1147 c.c. Twin 1⅛" S.U. Carburettor Conversion (Kit No. 511037).
2. Disc front brakes.
3. Competition brake linings and brake booster of any make.
4. Suspension equipment.
5. Oil cooler (group two events only).

NOTE: The Stage II engine, gearbox and Twin 1¼" S.U. Carburettor conversion have not been homologated for the Herald range.

WARRANTY

Attention is called to your vehicle warranty which expressly excludes any form of modification or alteration whatsoever to the vehicle specification without prior written consent of the Company. Also that the Company shall not accept liability if any defect is caused or aggravated by motor racing or rally driving.

The fitting of tuning parts or alterations to a part for the purpose of increasing performance is considered by the Company to place a vehicle in the above category whosoever supplied and/or fitted or altered the part. This is considered to apply whether or not the vehicle is actually used for motor racing or rally driving as its potential remains.

For reasons beyond our control, such as incorrect fitting and misuse, it is necessary to include Standard-Triumph "Stanpart" performance tuning equipment in this same category, and therefore, any performance tuning equipment when supplied as a "Stanpart", which alters the vehicle specification from Standard production, will be warranted in respect of *material failure only*. All claims submitted will be considered on merit and will be accepted subject to examination of the displaced part by Standard-Triumph to determine the cause of failure. Claims will not be accepted or considered for subsequent damage, or loss resulting from the failure of any part or parts, howsoever modified, altered, or fitted and any claims accepted will be limited to the replacement of the faulty part only.

Claims in respect of coach, trim or paintwork on a vehicle equipped with performance tuning equipment will be considered, however, claims for mechanical parts, such as transmission, brakes, etc., will be rejected on a vehicle with an altered mechanical specification.

FUEL OCTANE REQUIREMENT

Fuel octane ratings can be related to compression pressures, thus the higher the compression ratio, the higher the fuel octane requirement for maximum operating efficiency. The fuel octane requirement (research method) for the Spitfire is as follows:

9 : 1 compression ratio	..	Research octane number	97 minimum
9¾ : 1 compression ratio	..	Research octane number	100 „
10½ : 1 compression ratio	..	Research octane number	100 „

Fuels commercially available to suit these requirements are generally designated as Premium and Super, the octane ratings of which vary between Oil Companies and between countries. In general, however, the octane rating corresponds as follows:—

Premium	..	Research octane number	97 to 99
Super	..	Research octane number	101

Detonation resulting from the use of fuels of a lower octane rating than specified will, if allowed to continue, cause serious damage to an engine. Therefore, if a suitable high octane fuel is not available, the ignition setting must be retarded temporarily to suit. (See "Ignition Settings" on page 26.)

INTERIM AND STAGE II CONVERSION DATA

	Standard Spec. (Mk I)	*Interim Stage Tune*	*Stage II Tune*
Compression ratio ..	9·0 : 1	9·75 : 1	10·5 : 1
Power	63 b.h.p.	70 b.h.p.	90 b.h.p.
Maximum speed ..	92 m.p.h.	96 m.p.h.	107 m.p.h.
Accel. 0 to 60 m.p.h. ..	15·5 secs.	13·5 secs.	10·6 secs.
Accel. Standing ¼ mile	19·5 secs.	19·2 secs.	18·3 secs.
Max. permissible r.p.m.	6,000 r.p.m.	6,500 r.p.m.	7,000 r.p.m.
Carburettor type ..	S.U. 1¼" bore	Solex 32 PAIA	Weber 40 DCOE
Sparking plugs	Lodge CNY	Lodge CNY	Lodge 2 HN
plug gaps (L.A. 12 coil)	0·025"	0·025"	0·025"
plug gaps (H.A. 12 coil)	0·030"	0·030"	0·030"
Ignition setting (Static)..	13° B.T.D.C.	12° B.T.D.C.	2° B.T.D.C.
Crankcase breathing ..	Closed circuit	Mod. open circuit	Mod. open circuit
Distributor (Delco Remy)	Stanpart 209697	Stanpart 209697	Stanpart 211461
Valve clearances (cold)	0·010"	0·010"	0·010"
Petrol pump pressure ..	1½-2½ lb/sq.in.	2½-3½ lb/sq.in.	2½-3½ lb/sq.in.
Valve guides	Part No. 111869	Part No. 111869	Part No. 58923
Length (inlet) ..	2·25"	2·25"	2·06"
Bore (inlet)	0·312-0·313"	0·312-0·313"	0·312-0·313"
O/Dia. (inlet).. ..	0·501-0·502"	0·501-0·502"	0·501-0·502"
Length (exhaust) ..	2·25"	2·25"	2·25"
Bore (exhaust) ..	0·312-0·313"	0·312-0·313"	0·312-0·313"
O/Dia. (exhaust) ..	0·501-0·502"	0·501-0·502"	0·501-0·502"
Valve guide protrusion above cylinder head top face	0·749-0·751"	0·749-0·751"	0·749-0·751"
Valve springs	Part No. 136487	Part No. 136487	Part No. 140562
Free length	1·58"	1·58"	1·58"
Length at full lift ..	1·074"	1·074"	1·018"
Load at full lift ..	105 lbs.	105 lbs.	118 lbs.
Total number of coils	6¼	6¼	6¼
Camshaft	Part No. 211433	Part No. 211433	Part No. 211030
Inlet opens	18° B.T.D.C.	18° B.T.D.C.	45° B.T.D.C.
Exhaust closes ..	18° A.T.D.C.	18° A.T.D.C.	45° A.T.D.C.
Inlet closes	58° A.B.D.C.	58° A.B.D.C.	65° A.B.D.C.
Exhaust opens ..	58° B.B.D.C.	58°B.B.D.C.	65°B.B.D.C.
Maximum lift ..	0·311"	0·311"	0·368"

Distributor (Stanpart 209697)

Design Data	*Standard Specification and Interim Stage Tune*
Moving contact spring tension ..	17 to 21 ozs.
Firing angle	0°, 90°, 180°, 270°.
Closed period	36° ± 1°.
Open period	54° ± 1°.
Contact breaker gap	0·015".
Rotation (viewed on rotor arm) ..	Counter clockwise.

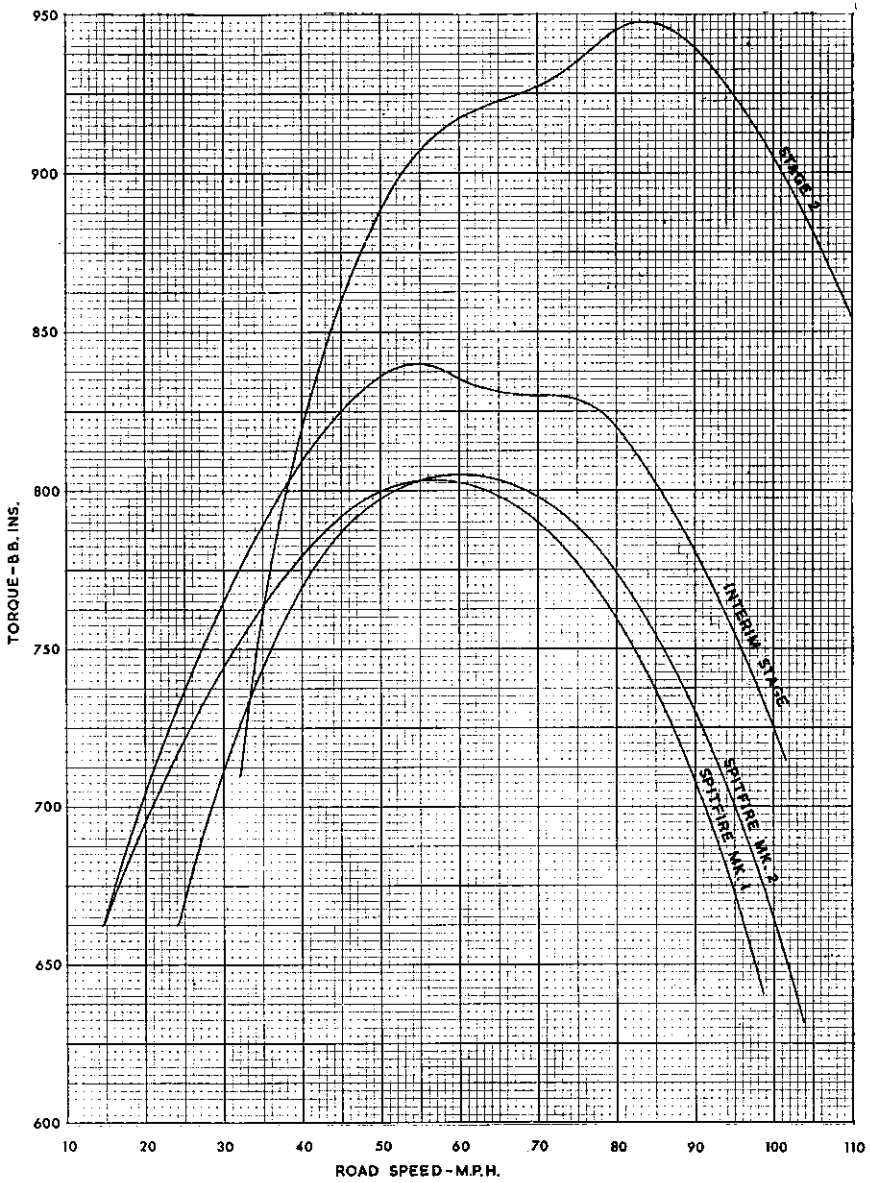


Fig. 2. Graph showing torque in various stages of tune relative to road speed using 4·11 : 1 axle ratio and 5·20 × 13 tyres

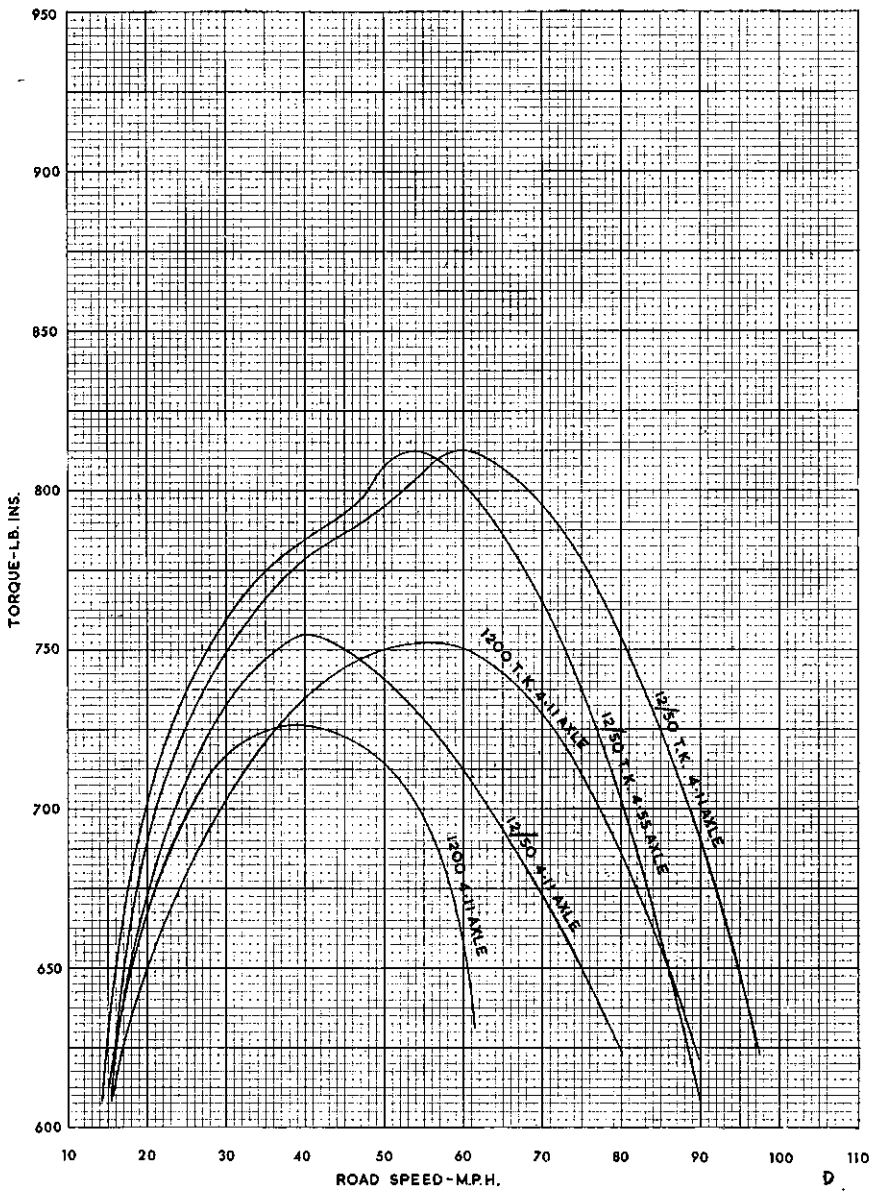


Fig. 3. Graph showing B.H.P. and B.M.E.P. relative to engine speed at various stages of tune

INTERIM STAGE CONVERSION

Introduction

The interim stage conversion may involve considerably more work than is readily apparent from a cursory appraisal of the major parts listed on page 13. Therefore, it is essential, before undertaking the work, that the vehicle be thoroughly checked for departures from the standards outlined in the following notes. (Bracketted page references apply to Workshop Manual).

Engine Features

Power output is governed primarily by the compression ratio, and the amount by which this is raised must be commensurate with the capability of the crankshaft and bearings to accept the increased loads placed upon them. Further limitations are imposed by the close proximity of the valve heads to the top face of the cylinder block top face at maximum camshaft lift. Maximum engine r.p.m. is also influenced by the design of the valve springs. Therefore, a compression ratio of 9·75 : 1 must not be exceeded whilst the above mentioned components remain to standard specification.

Only marginal advantage will result from using the Stage II camshaft in place of the camshaft specified for the Interim Conversion and will necessitate the fitting of the strengthened rocker gear and valve spring included in the list of parts comprising the Stage II Conversion. Full advantage from the Stage II camshaft is not realised within the speed range of 0 to 6,000 r.p.m. as it is primarily designed to produce maximum power at speeds in excess of this range, when fitted with the new four-port cylinder head.

Cylinder Bore and Pistons

Check cylinder bore wear for taper and ovality (page 1·131) and if this does not exceed 0·005″, new pistons may be fitted, provided that the cylinder bores are lightly honed to form a new bedding surface for the new piston rings. A glaze "buster" may be used for this purpose. The cylinder bore grading sizes F, G or H are stamped on the manifold side of the cylinder block outer wall, adjacent to each cylinder bore. The pistons are similarly graded and should be selected to suit the bore size. Lips at the bore top, formed by wear, must be carefully removed by scraping.

Increased stresses resulting from raising the compression ratio necessitate the use of solid skirt piston assemblies, Part No. 137206. These were introduced at Engine No. FC.2449 and include the following details.

Top compression ring (Chrome)	129638
Second compression ring (Tapered)	129639
Oil scraper ring	129640
Gudgeon pin (Push fit at 68°F.)	137528
Circlips	508978

The above pistons must be fitted to engines built prior to Engine No. FC.2449.

Connecting Rods

Strengthened connecting rod assemblies bearing the original part number were introduced at Engine No. FC.30193. These rods are provided with new cap bolts which should be tightened to the same torque load as the original bolts, but do not require lock plates.

The above connecting rod assemblies must be fitted in sets and should be fitted, when undertaking tuning work, to engines built prior to FC.30193.

Flywheel

New type flywheel place bolts, Part No. 138526, were fitted from Engine No. FC.30193. These bolts do not require lock plates but should be tightened to the same torque load as the original bolts. The fitting of these bolts is not essential, but if used to replace the original bolts a complete set should be fitted.

Ignition System

Lucas HA.12 H.T. coils were fitted from approximate Commission No. FC.29985. Slight advantage may be gained by fitting this in lieu of the earlier L.A.12 coil.

Lodge CNY ½″ × 14 mm. sparking plugs, remain unchanged but should be gapped as follows:

Spark plug gap with L.A.12 coil	0·025″
Spark plug gap with H.A.12 coil	0·030″

Although the ignition distributor remains unchanged and the automatic vacuum advance mechanism is retained, the static ignition setting should be reset at 12 degrees B.T.D.C.

Carburettor

The Solex Automatic twin choke carburettor, included in the list of parts comprising the Interim Stage Tune, incorporates a zero progressive starter and accelerator pump. The idling is set by adjusting the "volume" and "slow running" screws, the procedure being as described in the Workshop Manual for a single choke instrument.

Clutch

Clutch pressure plate clamping loads have been increased since first production of the Spitfire 4, and when converting an earlier engine to the Interim Stage of Tune, an owner is strongly recommended to fit a new clutch unit, Part No. 514300, or to modify the existing unit to the latest specification as described in the Workshop Manual.

Clutch data is as follows:

Clutch Part No. 510446 (Fitted up to Engine No. FC.17136 HE)	Total clamping load 815 lbs. consisting of: 6 Blue springs at 95 lbs. 3 Red springs at 80 lbs.
Clutch Part No. 513662 (Fitted from Engine No. FC.17136 HE to FC.36731 HE)	Total clamping load 855 lbs. consisting of: 9 Blue springs at 95 lbs.
Clutch Part No. 514300 (Fitted from Engine No. FC.36731 HE onwards)	Total clamping load 945 lbs. consisting of: 3 Blue springs at 95 lbs. 6 Dark green and yellow spring at 110 lbs.

Spring Part Nos.:

Blue 40907; Yellow and Dark Green 10914; Red 511495

Fitting Interim Stage Conversion

All remaining items are of standard specification except where stated otherwise in the following procedure.

1. Remove the cylinder head from the engine, dismantle the head and remove all carbon deposits.

2. Examine and renew defective valves, guides, springs and valve seats. Refer to "data section" for dimensions.

3. Machine approximately 0·04″ from the cylinder head joint face to give a combustion chamber depth of 0·388″. Achieve a surface finish of 65 to 85 micro-inches to ensure a gas-tight joint and remove all burrs and sharp edges caused by machining. Refer to "Cylinder Head Preparation" on page 21.

4. Lap in each valve to its seat, wash all items thoroughly, re-assemble the cylinder head and attach it to the engine. Observe the instructions given under "Valve Rocker Gear" on page 16 when re-assembling the rocker shaft.

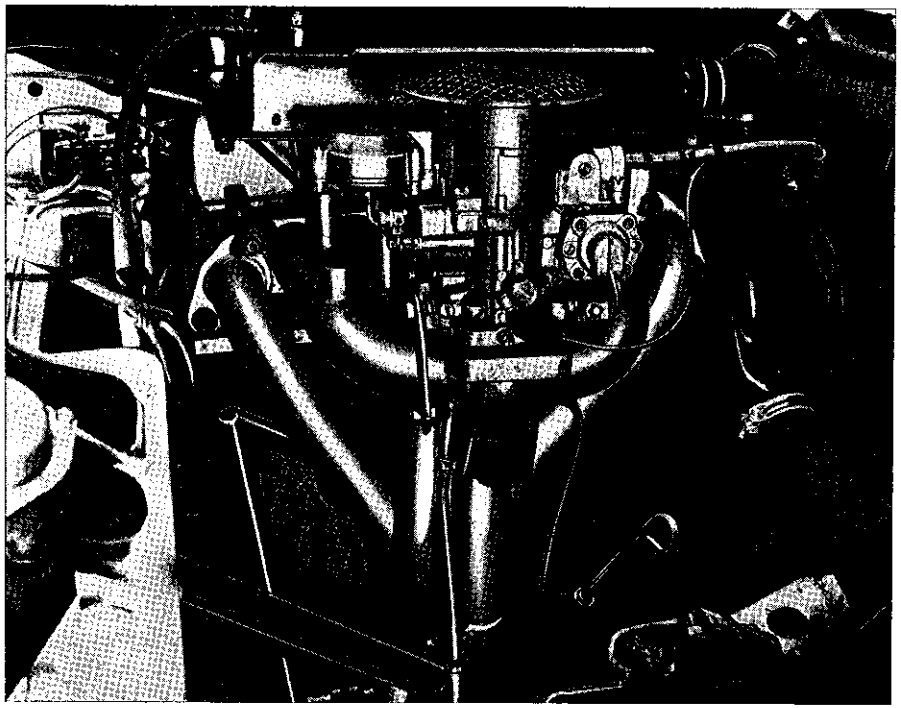


Fig. 4. Interim stage conversion

70 B.H.P. INTERIM STAGE CONVERSION

The full list of parts required to convert a Spitfire 4 to Interim Tune is as follows:

Description	*Part No.*	*No. Off*
Carburettor Assembly (Solex Compound)	211736	1
Joint Washer, Carburettor	141178	2
Insul. Washer, Carburettor	140110	1
Stud, Carburettor to Manifold	112907	4
Inlet, Manifold	306895	1
Gasket, Manifold to Head	118518	1
Washer, Plain	WP0008	4
Washer, Lock	WL0208	4
Nut	HN2008	4
Bolt	HB0862	1
Stud, Header Tank Brackets	100433	2
Petrol Pipe, Rubber, 9″ long	139775	1
Suction Pipe, Carburettor to Distributor	208645	1
Lever Assembly, Accelerator Operating	140553	1
Spring Dowel	DS1312	1
Air Cleaner	140708	1
Clip, Air Cleaner	141490	1
Exhaust, Manifold	306797	1
Drain Pipe, Manifold	141654	1
Tubing Sleeve	TL0005	1
Tubing Nut	61878	1
Washer, Lock	WL0208	1
Washer, Medium	WM0058	1
Wedge, Hotspot	141106	1
Breather Pipe Assembly	140575	1
Extension, Breather Pipe	140580	1
Packing Piece	141660	4
Gasket, Cylinder Head	207930	1

NOTE : Strip and machine existing cylinder head to 9·75 : 1 ratio.

or use

Cylinder Head Assembly	514043	1

Then re-assemble, valves, springs, collars, split cones, rockers, etc.

STAGE II CONVERSION

General

A high compression engine, tuned to give the ultimate performance, is more sensitive to abuse than a normal production engine built to a standard specification. The term "abuse" applies to such factors as "excessive carbon deposit" causing pre-ignition and pinking, "weak fuel mixtures", "leaking gaskets", "incorrect heat grade plugs" and "over advanced ignition settings", any of which, if undetected over a period of time, can have disastrous results and may involve the owner in costly repair bills.

Strict observation of specified nut tightening torques is essential to prevent over-stressing components, a condition which may not be apparent during assembly but could result in early fatigue and premature failure. Over-stressing can also result from exceeding the maximum engine revolutions recommended on page 7. Therefore, habitual use of the revolution counter should be made, particularly when making downshifts.

WARNING: When building to Stage II tune it is essential to fit all components listed on pages 19 and 20, the necessity for strengthened crankshaft, pistons and connecting rods being particularly emphasised for reasons of safety. Inadequate preparation and incorrect assembly may not only prove costly in terms of money, but could prove extremely dangerous to life and limb. It is advisable, therefore, to entrust such work to a skilled craftsman, qualified to do the work entailed in the preparation of vehicles to competition standards.

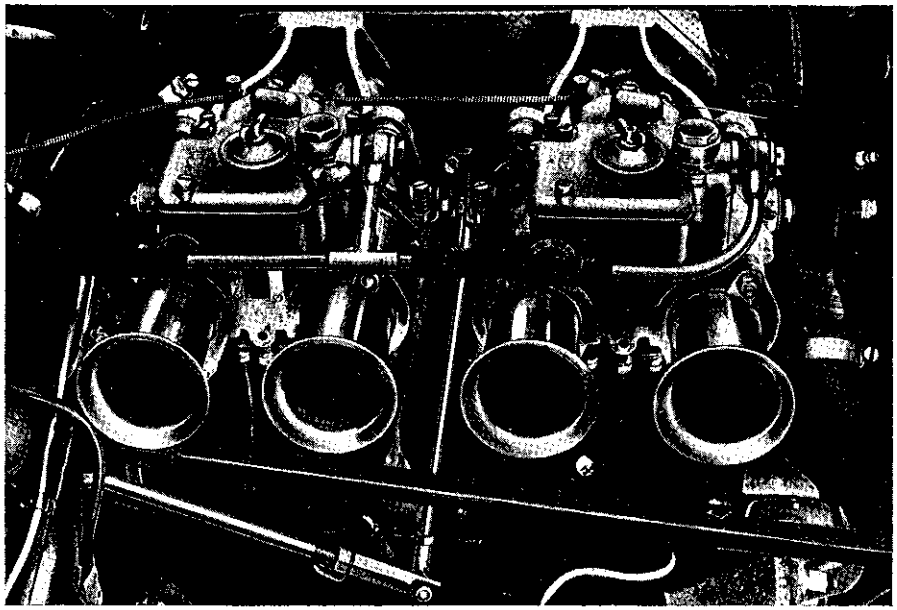


Fig. 5. Stage II conversion

Procedure

Refer to those pages of the Workshop Manual shown bracketed in the following procedure:

Remove the engine and gearbox unit from the car (page 1·118) and dismantle both units to assess the serviceability of components for further use (pages 1·124 and 2·206).

Remove cylinder studs numbers 6 and 7 (page 1·136) and replace them with two short studs, Part No. 129677, tightening them to 10-12 lb.ft.

Cylinder Bore and Pistons

Check cylinder bore wear for taper and ovality (page 1·131) and if this does not exceed 0·005″, new pistons may be fitted, provided that the cylinder bores are lightly honed to form a new bedding surface for the new piston rings. A glaze "buster" may be used for this purpose. The cylinder bore grading sizes F, G or H are stamped on the manifold side of the cylinder block outer wall, adjacent to each cylinder bore. The pistons are similarly graded and should be selected to suit the bore size. Lips at the bore top, formed by wear, must be carefully removed by scraping.

To facilitate correct assembly, because the gudgeon pin is slightly off-set from the piston centre line, the word "Front" is etched on the piston crown and a dimple is formed in the front gudgeon pin boss, viewed from the underside of the piston. The gudgeon pin should be a light tap fit into the piston at 68°F. Check the ring gaps (page 1·103) and assemble the rings to the piston (page 1·130).

IMPORTANT: Under no circumstances must the piston crowns be stamped, indented, or marked in any way.

Crankshaft and Bearings

Install the new crankshaft, Part No. 306549, bearings, Part No. 140111 and thrust washers, Part No. 141207 (page 1·127) and fit the strengthened connecting rods.

Strengthened connecting rod assemblies bearing the original part number, were introduced at Engine No. FC.30193. These rods are provided with new cap bolts which should be tightened to the same torque load as the original bolts, but do not require lock plates.

The above connecting rod assemblies must be fitted in sets and should be fitted when undertaking tuning work, to engines built prior to FC.30193.

Camshaft

Install the new camshaft, Part No. 211030 and attach the camshaft sprocket and timing chain by adopting the procedure given on pages 1·134, 1·137 and 1·138 of the Workshop Manual, and substituting 0·015″ No. 1 rocker timing clearance for the 0·040″ clearance quoted on page 1·138.

Fuel Pump

Fit a new "HI-LIFT" fuel pump or modify the existing pump by substituting the diaphragm spring for a stronger one, Part No. 139760 to provide an increased pressure of 2½ to 3½ p.s.i. Gaskets may be added between the pump flange and cylinder block to reduce excess pressure.

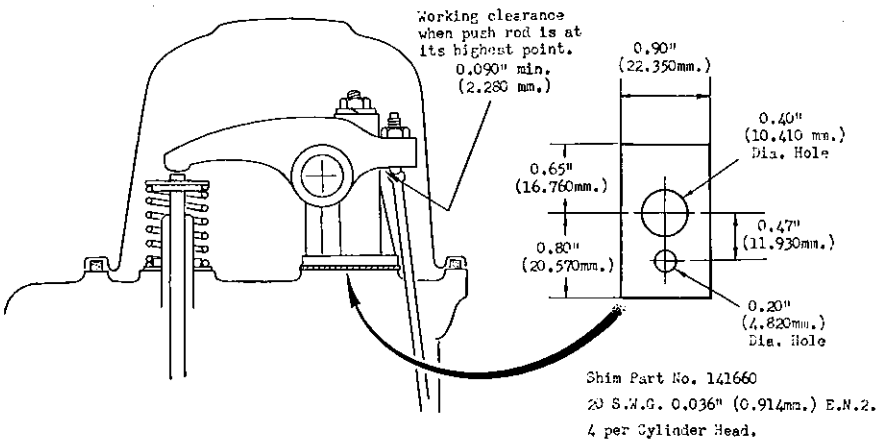


Fig. 6. Details of rocker shaft pedestal shim

Cylinder Head

Ensure that the water delivery tube, Part No. 138135 is correctly installed in the new four-port cylinder head, Part No. 513964, and refer to instructions given under "Cylinder Head Preparation".

Fit the valve guides, Part No. 111869 (Exhaust) and Part No. 58923 (Inlet). Dimensions are given under "Data" on page 7 and the procedure is described on page 1·134 of the Workshop Manual.

Having carefully lapped in the new valves, Part No. 131179 (Exhaust) and Part No. 126893 (Inlet), thoroughly clean all components and assemble the valves, using new valve springs, Part No. 140562.

Fit the assembled head to the cylinder block.

Valve Rocker Gear

Using the new rocker shaft details listed on page 20, assemble the rocker shaft (page 1·137) and screw the adjusters fully into the rockers to provide intitial clearance and thus prevent damage to the push rods.

Install the push rods, assemble the rocker shaft to the cylinder head and check the rockers for clearance as follows:

Accumulative machining tolerances and the further protrusion of the valve tip, beyond the top face of the cylinder head after valve grinding, may necessitate the insertion of shims between the base of the rocker shaft pedestal and the cylinder head to obtain a minimum working clearance of 0·09″ between the cup edge of the push rod and the underside of the rocker, as illustrated on Fig. 6.

All eight push rods should be checked for clearance at this position when the camshaft is turned to the highest point of lift for each valve. The clearance can be increased by use of additional shims, the total thickness of which must be the same under each pedestal. The shims may be made to the dimensions given on Fig. 6 or purchased under Part No. 141660.

Finally, ensure that the rocker cover is not distorted by over-tightening, thus causing the cover to foul the rockers.

Manifolds and Carburettors

Fit the inlet manifolds and carburettors, together with support brackets and rods as applicable to the type of manifold supplied. A typical arrangement is shown on Fig. 7. Refer to "Cylinder Head Preparation" for matching of ports before fitting the exhaust manifolds.

The arrangement drawing of the carburettor installation shows double coil spring washers and castellated nuts locked by split pins at the carburettor flanges. These nuts should be tightened sufficiently to permit slight movement of the carburettors on their "O" ring rubber gaskets when gripped by hand.

When fitting the carburettor support rods, carefully adjust the support stay nuts to prevent movement of the carburettors during tightening.

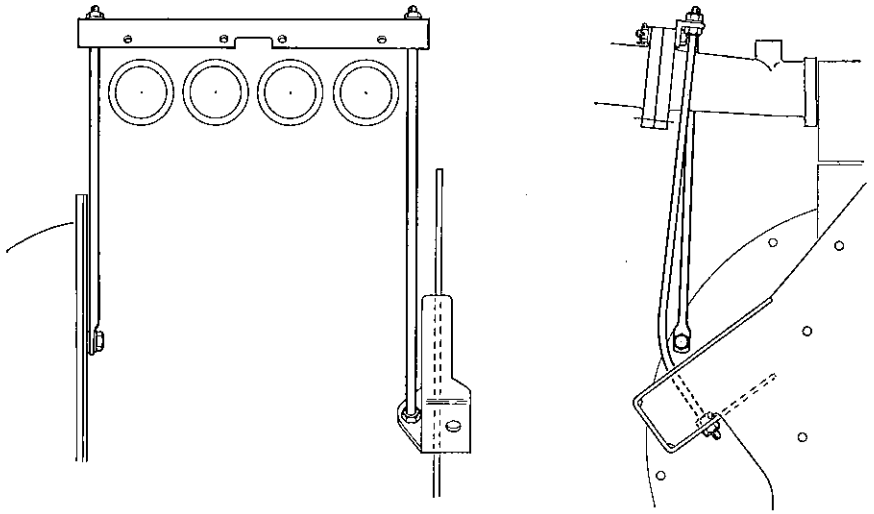


Fig. 7. Method of supporting Weber carburettors (applicable to the first 100 sets only)

Engine Breather

A sealed breathing system must not be retained when undertaking Stage II tune. Therefore, all Spitfires incorporating sealed breathing should be modified. This involves removing the "sealed breather rocker cover" and replacing it with the cover, Part No. 134654, and filler cap, Part No. 113569, fitted to earlier Spitfire 4's.

In addition to above, remove the existing breather pipe assembly from the crankcase or, if a sealed breathing system is fitted, remove the blanking plug from a hole in the side of the crankcase and fit the manifold breather pipe, details listed on page 19.

Ignition System

Referring to page 1·140 of the Workshop Manual, for the correct method of shimming, fit the distributor pedestal and distributor. Set the ignition timing at 2° B.T.D.C. See page 26.

Lucas H.A.12 coils were fitted from approximate Commission No. FC.29985. Advantage may be gained by fitting this in lieu of the earlier L.A.12 coil.

Lodge 2.HN spark plugs should be used and gapped as follows:

Spark plug gap with L.A.12 coil .. .. .. 0·025″

Spark plug gap with H.A.12 coil .. .. .. 0·030″

Clutch and Gearbox

To accept the increased torque resulting from Stage II tune, it is essential to fit the Borg & Beck diaphragm clutch and the stronger gears included in the Stage II parts list. The stronger gears provide closer ratios, making them more suitable than the original gears for competition work. Instructions for gearbox removal, dismantling, re-assembly and refitting are given in the Workshop Manual.

A steel clutch bell housing, Part No. 210449, superseded the aluminium housing fitted up to Commission No. FC.13627. Therefore, when converting an earlier car to Stage II Tune, it is essential to fit the stronger cast iron housing and to re-balance the new clutch to the flywheel.

RATIOS WITH NEW GEAR DETAILS

	Top	*3rd*	*2nd*	*1st and Rev.*
Ratios	1	1·25	1·78	2·93
Overall ratios with 4·11 axle	4·11	5·16	7·31	12·06

90 B.H.P. STAGE II CONVERSION

The full list of parts required to convert a Spitfire 4 to Stage II Tune is as follows:

ENGINE *Description*	*Part No.*	*No. Off*
Cylinder Head (four-port type) Compression Ratio 10·5 : 1 ..	513964	1
Valve, Exhaust	131179	4
Spring, Valve	136487	4
Spring	140562	8
Gasket, Cylinder Head	207930	1
Stud, Cylinder Head Attachment	129677	2
Exhaust Manifold (four-branch)	306716	1
Gasket, Exhaust Manifold	139242	1
Inlet Manifold (Front)	211039	1
Inlet Manifold (Rear)	211040	1
Stud (Carbs. to Manifold)	141605	8
Steady Plate	141602	1
Washer (Steady Plate to Manifold)	WL0208	4
Nut (Steady Plate to Manifold)	HN2008	4
Steady Rod, Front	141603	1
Steady Rod, Rear	141604	1
Nut (5/10″ U.N.F.), Steady Rod Attachment	JN2108	4
Clamp (Manifold Attachment)	137845	2
Washer (Manifold Attachment)	WL0209	6
Nut (⅜″ U.N.F.), Manifold Attachment	100498	6
Carburettor (Front), Weber Type 40 DCOE2	306947	1
Carburettor (Rear), Weber Type 40 DCOE2	306948	1
Throttle Lever Assembly	140734	1
"O" Ring, Carbs. to Manifold	139718	4
Washer, Carbs to Manifold	WD0158	8
Nut ($\frac{5}{16}$″ U.N.F. slotted), Carbs. to Manifold	LN2208	8
Pin (Cotter)	PC0008	8
Lever Assembly, Accelerator Operation	140935	1
Throttle Rod, Adjustable	140936	1
Spring, Hi-Lift Fuel Pump	139760	1
Indent Plate, Hi-Lift Fuel Pump	139873	1
Petrol Pipe Assembly	140697	1
Breather Pipe Assembly	140575	1
Breather Pipe Extension	140580	1
Ignition Distributor Assembly	211461	1
Flywheel Assembly	141675	1
Dowel	DP0410	2
Clutch Cover Assembly	212037	1
Clutch Driven Plate	139665	1
Camshaft	211030	1
Stud (Drilled) Carburettor Attachment	141686	8
Angle Bracket	142685	1
Stud (⅜″ U.N.F. × 1·63″) Cylinder Head Attachment	129677	2
Badge ("S2") Trunk Lid	611524	1
Clip, Badge Attachment	610623	4
Water Rail	131530	1

Crankshaft	306549	1
Main Bearing Shells	140111	6
Thrust Washer	141207	2
Piston Assembly	139267	4
Connecting Rod Assembly	138549	4
Bearing Shells—Connecting Rod	138211	8
Tappet	138438	8
Rocker Shaft	137809	1
Rocker Pedestal, No. 1	137642	1
Rocker Pedestal, No. 4	137643	1
Rocker Pedestal, Nos. 2 and 3	128424	2
Rocker No. 1	104834	4
Rocker No. 2	104836	4
Plug, Rocker Shaft	137811	2
Pin, Cotter	PC0010	2
Core Plug	27378	1
Rev. Counter (8,000 r.p.m.)	211635	1

GEARBOX

Description	*Part No.*	*No. Off*
Cover, Front End, Gearbox	138502	1
Dowel	DP0205	1
Oil Seal	141758	1
Reverse Idler Gear Assembly	132293	1
Countershaft	119889	1
Gear Cluster, Countershaft	208788	1
Retaining Ring	119891	3
Retaining Ring	119892	1
Needle Rollers	119893	50
1st and 2nd Gear Sleeve Assembly	132446	1
2nd Gear	132296	1
3rd Gear	132097	1
Shaft Constant Pinion	211000	1
Bearing, Needle Roller	118507	1
Circlip, Constant Pinion Shaft	129839	1
Sleeve, Ball Throwout	139563	1
Ball Bearing	139572	1
Washer, 3rd Speed Gear	104466	1

EXHAUST

Description	*Part No.*	*No. Off*
Exhaust Pipe, Intermediate	211922	1
Clip, Pipe to Manifold	55801	2
Silencer	212070	1
Clip, Silencer to Pipe	138807	1
Bolt	HB0820	2
Bolt	HB0822	1
Washer	WP0107	3
Washer	WL0208	3

CYLINDER HEAD PREPARATION

Minimum restriction to gas flow through the valve ports is essential for maximum performance and because normal valve grinding and the cutting of valve seats do not constitute a modification, this practice is permissible under race rules and regulations. Therefore, one should aim to remove protuberances from the valve throat shape. Fig. 8 illustrates what may be achieved by careful machining. This will, however, reduce the life of valves and valve seats to fewer regrinds before new parts are necessary, but this is part of the price that one must pay for better performance.

A further gain in power output will result from machining and polishing of the manifold, cylinder head ports and combustion chambers. When this is accomplished satisfactorily, ensure that gas flow is not impeded by protruding gaskets which, if necessary, should be carefully trimmed back to match the port. Take particular care when matching the round ports of the four-branch exhaust manifold with the square ports of the cylinder head to ensure that the manifold or gasket does not partially cover the square port area. Do not open out this section of the cylinder head.

The normal practice of polishing the combustion chambers, ports and manifold interiors is acceptable, provided that they are not enlarged or distorted during the process. Piston crowns may be buffed with an open type buffing wheel (not stitch type) to minimise carbon build-up on the piston crown.

Further work may be undertaken relevant to gas flow efficiency. This entails balancing the flow of the assembled cylinder head and manifolds to obtain uniformity of flow to each of the cylinders. Specialised machinery and equipment are required for this operation which should be entrusted to specialists in this work.

Method of Checking Compression Ratio and Cubic Capacity

Rules governing competition work vary in different parts of the world, the cubic capacity and compression ratio usually being the dominating factors. Disappointment from disqualification, after a race win, because of excess cubic capacity or compression ratio, can be avoided by carefully checking and making the necessary corrections during assembly as follows:

Swept Volume

The swept volume is the amount of gas displaced by moving the piston from the bottom to the top of its stroke and is calculated:

$$\text{From the formula } \pi \frac{D^2}{4} \times S$$

Where D = Diameter of cylinder in centimetres.

S = Stroke of crankshaft in centimetres.

Clearance Volume

The clearance volume is the total amount of gas space less the swept volume and is determined as follows:

(a) Cylinder Volume above Piston T.D.C.

1. With the cylinder head and gasket removed, mount a dial indicator on the top face of the cylinder block with the plunger contacting the piston crown at T.D.C. approximately.

2. By rocking the crankshaft in both directions, establish the true T.D.C.
   NOTE : At this stage check, and if necessary correct, the position of the pointer attached to the timing chain cover relative to a corresponding hole in the crankshaft pulley.
3. Using a micrometer depth gauge, measure the depth of the piston at T.D.C. below the top face of the cylinder block which for convenience is referred to as dimension "V". The clearance volume above the piston is now calculated from the formula: $\pi \frac{D^2}{4} \times V$.

(b) Combustion Chamber Volume.

1. Assemble the valves and a set of disused sparking plugs to the cylinder head. Place the inverted cylinder head on a firm bench and using a spirit level, pack under the cylinder head to level the face.
2. Mount a scribing block on the upper face of the cylinder head and adjust the pointer to the same height as the base of the block. Traverse the block to bring the pointer over the combustion chamber.
3. Using a beaker, graduated in cubic centimetres and filled to a pre-determined level with a low-tension fluid, pour the fluid into the combustion chamber until the level reaches to point of the scriber.
4. Note the level of fluid remaining in the beaker and subtract this reading from the original quantity to obtain the cubic capacity of the combustion chamber.
5. Repeat with each remaining combustion chamber.

(c) Volume Contained by Cylinder Head Gasket.
The final item required to complete the "clearance volume" is that contained by the cylinder head gasket. This is quoted in the data on page 23.

To summarise, the total clearance volume is the sum of the following:

(a) Cylinder volume above piston T.D.C.
(b) Combustion chamber volume.
(c) Volume contained by cylinder head gasket.

Compression Ratio

The compression ratio is the relation of the swept volume to the total gas space and is expressed by the formula:

$$\frac{\text{Clearance volume + swept volume}}{\text{Swept volume}} = \text{compression ratio.}$$

Corrections to Clearance Volume

Calculations will determine the extent of corrections necessary to obtain the correct clearance volume and compression ratio.

Face machining of the cylinder head will reduce the clearance volume and raise the compression ratio.

The cubic capacity of the combustion chambers, if insufficient, can be increased by carefully machining the flat face of the combustion chamber, that is, the face containing the valve seats. However, great care must be taken to avoid altering the shape or contour of the combustion chamber walls, the wall angle and the dimension of the radii between the face and wall. All sharp burrs on machined edged should be carefully removed.

Interim Stage Cylinder Head

A cylinder head of 9·75 : 1 compression ratio may be obtained under Part No. 514043 or alternatively the existing cylinder head can be modified in accordance with the following data:

Amount required to machine face of cylinder head for 1 c.c. alteration	·013″
Amount to machine off cylinder head to raise compression ratio from 9·0 : 1 to 9·75 : 1	·040″
Swept volume	286·75 c.c.
Volume of combustion space at 9·75 : 1 (Valves and plugs in position)	27·67 c.c.
Distance of piston below face of cylinder block	·015″ = 1·07 c.c.
Volume of cylinder head gasket	4·07 c.c.
Depth of combustion chamber at 9·75 : 1 compression ratio	·388″
Total clearance volume	32·8 c.c.
Maximum permitted variation between any of the combustion chambers	1 c.c.

Stage II Cylinder Head

A four-port cylinder head of 10·5 : 1 compression ratio may be obtained under Part No. 513964. Cylinder head data is as follows:

Compression ratio	10·5 : 1
Amount required to machine face of cylinder head for 1 c.c. alteration	·0125″
Swept volume	286·75 c.c.
Volume of combustion space at 10·5 : 1 (Valves and plugs in position)	24·71 c.c.
Distance of piston below face of cylinder block	·012″
Volume of cylinder head gasket	4·07 c.c.
Depth of combustion chamber at 10·5 : 1 compression ratio	·388″
Total clearance volume	30·33 c.c.
Maximum permitted variation between any of the combustion chambers	1 c.c.

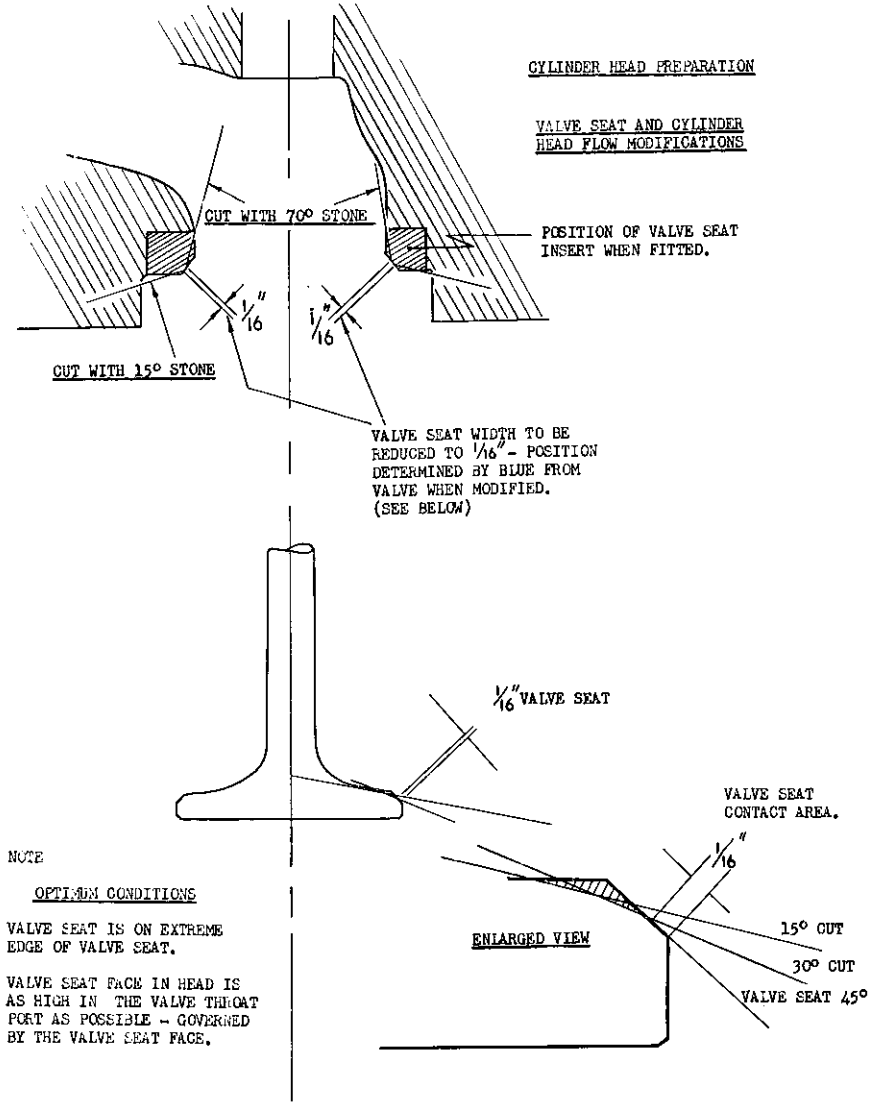


Fig. 8. Showing protuberances which may be removed to improve gas flow

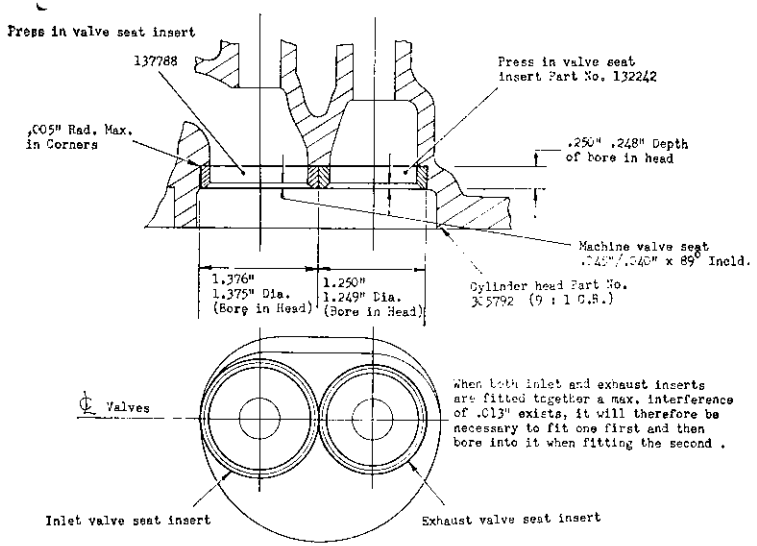


Fig. 9. Valve seat inserts (Spitfire 4)

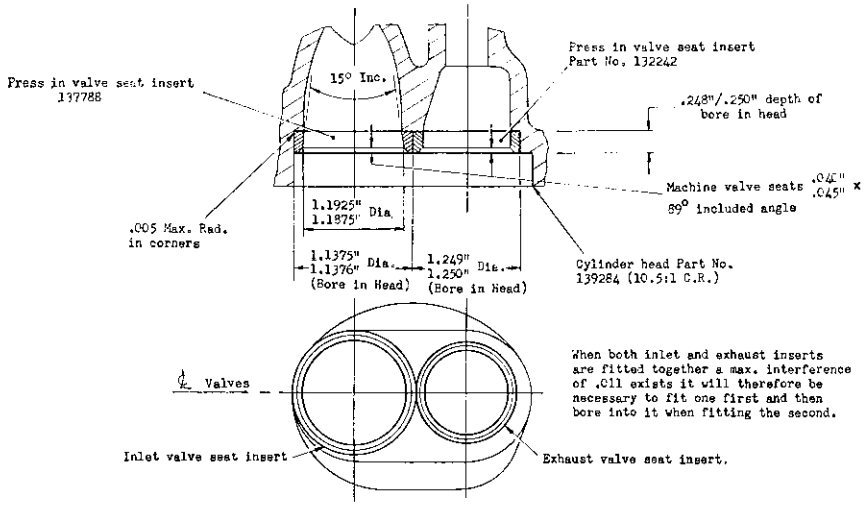


Fig. 10. Valve seat inserts (Spitfire Stage II)

IGNITION SETTINGS

Stage II

Ignition settings become increasingly critical as compression ratios are raised, thus necessitating precise settings for Stage II tune. The static settings quoted on page 7 make no allowance for timing chain wear, gear backlash or wear in the distributor and must, therefore, be regarded as nominal. Furthermore, weak governor springs or wear in the centrifugal advance mechanism may affect the advance curve, thus causing inaccurate timing at some part of the speed range, regardless of the accuracy achieved when making the static setting. Therefore, before fitting the distributor, it may be advisable to have the unit checked on a distributor tester for comparison with the figures quoted in the data sections.

A satisfactory method of setting the ignition timing is as follows:

1. Turning the engine, in a clockwise direction only, until No. 1 piston is at T.D.C. on compression stroke, align a hole in the crankshaft pulley with the straight edge of a pointer attached to the timing cover. This is shown in the Owner's Handbook, Fig. 66.

2. Turn the "micro" adjuster from end to end to establish its mid-point and set the adjuster two clicks in retard of the mid-point.

3. With the rotor arm pointing towards the generator (firing No. 1 plug), and a 12 volt lamp connected between the L.T. distributor terminal and earth, slacken the distributor clamping bolt.

4. Rotate the distributor slightly anti-clockwise to bring the fibre heel of the moving contact clear of the cam. The test bulb should now be illuminated. Rotate the distributor clockwise to the exact point where the bulb is extinguished and tighten the clamp bolt.

5. Advance the micro adjuster two clicks thus bringing it to the centre of its range. This will enable its correct position to be easily re-established when necessary. Because one click is equal to one flywheel degree, two clicks will give the correct static timing of 2° B.T.D.C.

Road test performance will determine the final setting best suited to the engine and the fuel being used.

Interim Stage

Adopt the foregoing procedure, substituting twelve clicks in place of two, mentioned in paragraphs 2 and 5.

NOTE : The fibre heel of the moving contact tends to bed-in from new, and dry cam lobes accelerate wear, thus reducing the gap and affecting the ignition timing. The lobes should be lubricated, therefore, and the gap re-checked after a short period of running.

Distributor Test Data (Stanpart No. 209697)

The following r.p.m. figures relate to distributor speed and must be doubled for conversion to crankshaft speed. The angles, given in degrees, also relate to the distributor and must be doubled when converting to flywheel angles. For example: in the following table the distributor speed is quoted at 1,450 r.p.m. giving 11° to 13° distributor advance, this being equivalent to 2,900 crankshaft r.p.m., giving 22° to 26° advance measured around the flywheel or crankshaft pulley.

Centrifugal Timing Tests		*Vacuum Advance Tests*	*Checking on Rising*
1. Set 0° at distributor speed less than 400		*Inches Hg*	*Advance Degrees*
2. Run distributor up to 2,500 r.p.m. advance to be 11° to 13°.		2	0
3. Check at following decelerating speeds.		2½	1½
		3	3
		5	3 to 7
Speed r.p.m.	*Advance Degrees*	6	5¼ to 8
1,450	11 to 13	7	7 to 9
1,200	9·4 to 11·4	8	8 to 10
900	7·4 to 9·4	9	8½ to 10½
500	0 to 1·5	10	9 to 11 max.

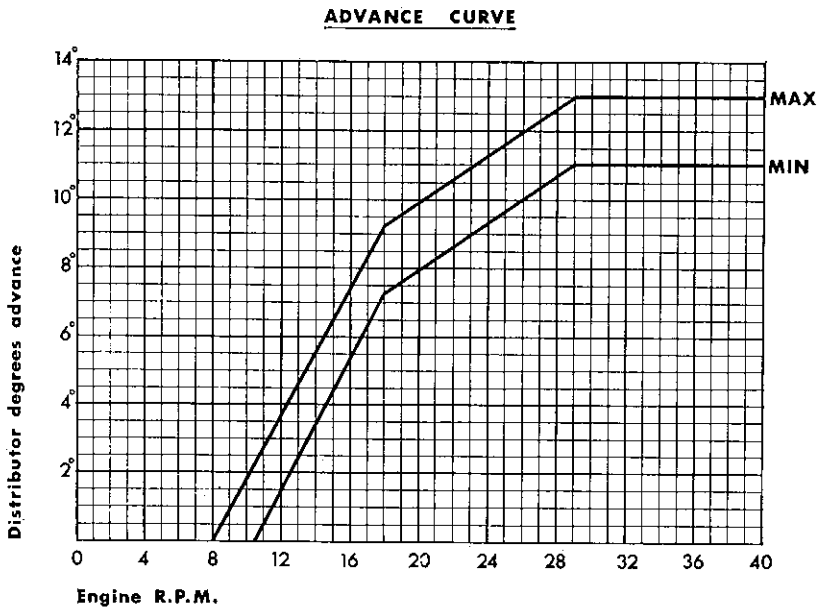


Fig. 11. Graph showing centrifugal advance for interim stage

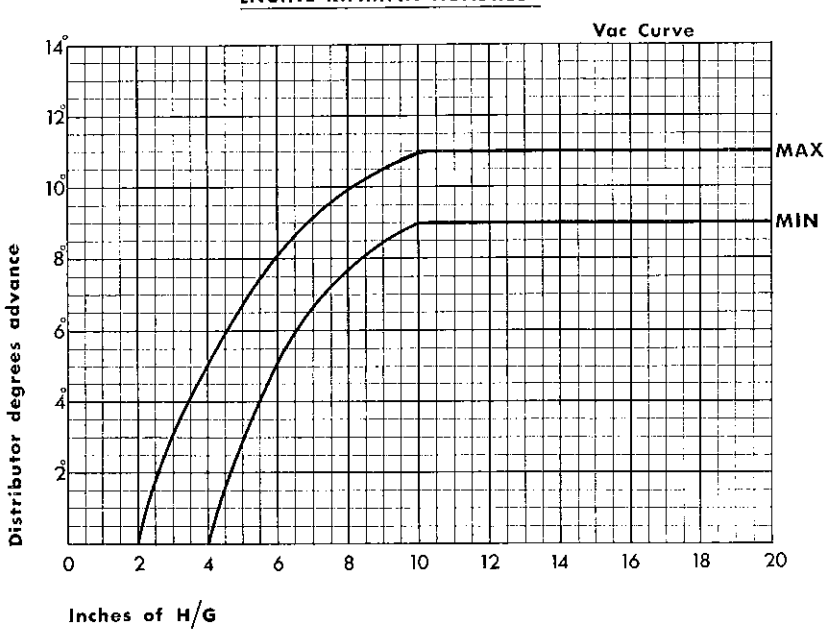


Fig. 12. Graph showing vacuum advance for interim stage

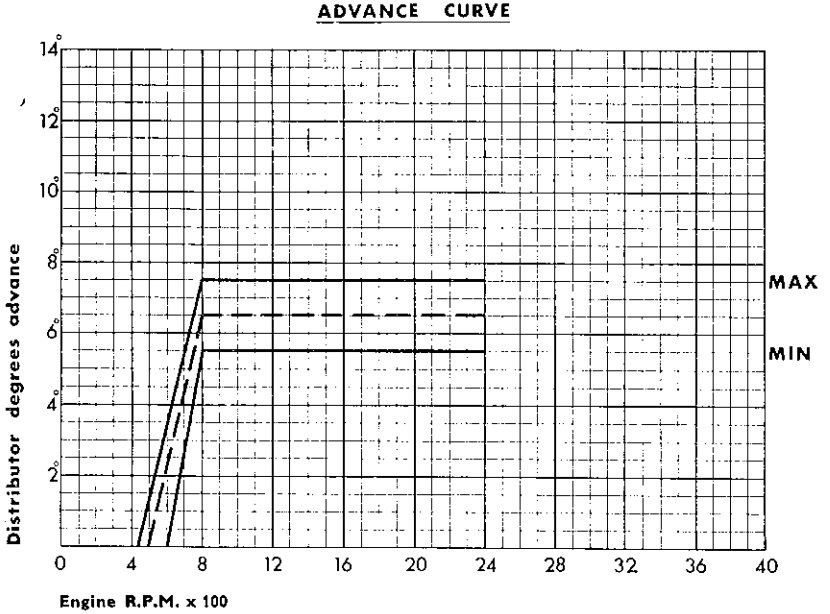


Fig. 13. Graph showing centrifugal advance for Stage II tune using A.C. Delco distributor (Stanpart 211461). The vacuum advance unit is not used

SOLEX CARBURETTOR MODEL B32 PAIA

Operation (Fig. 14)

Zero Progressive Starter. Operation of the starter is by rotation of the starter disc valve (Dd), which is connected to the dashboard control by means of a flexible cable and lever.

When starting from cold the dashboard control is pulled fully out (Full Rich Position) thus aligning a slot in the starter valve (Dd) with the main feed channel from the starter well. The depression created below the throttle valve on operating the starter motor causes petrol to discharge from the starter jet (Gs) into the starter well, where it is emulsified by air passing through small holes in the starter emulsion tube, the resultant mixture then passing into the inlet manifold via the main outlet port. At the moment of the engine firing and running an increase in manifold depression, consequent to the increase in engine revolutions, will cause the piston (Pn) to move downward, thus allowing air to pass from the air-intake to the starting system for the dual purpose of weakening the mixture and allowing the engine to develop power.

When the engine has run for a few seconds the dashboard control is pushed in approximately half-way and, if necessary, the vehicle can be driven away without difficulty although the engine is still relatively cold, due to the partly open throttle-valve creating depression and consequently a mixture discharge at a point just below the choke-tube.

As the engine warms up the dashboard control is moved gradually inward, thereby permitting the starter valve to both progressively weaken the mixture and provide a range of fast-idle speeds; the speeds gradually decreasing as the control approaches the fully OFF position. When the dashboard control is pushed fully home the starter unit will have been put completely out of action by the closure of the various air and petrol orifices.

The Idling Circuit. This supplies through orifice (io) mixture required for idling when the engine is warm. It also provides, through by-pass (Bp), the mixture required as the throttle is first opened, but before it opens enough for the main spraying orifice (Oo) to begin to discharge.

The circuit is as follows: Petrol is supplied from the reserve well (v) and metered by the pilot jet (g). Emulsifying air is metered by a fixed orifice sited directly above the pilot jet. When idling additional air passes through by-pass (Bp) and the volume of this mixture is controlled by screw (W). On leaving idling orifice (io) the mixture is further emulsified by air passing round the throttle (V), the latter being held slightly open by an adjustment screw. As the throttle is opened engine depression is directed to the by-pass orifice (Bp) which discharges additional mixture to meet engine requirements until the throttle (V) has been opened sufficiently for the main spraying system to come into operation.

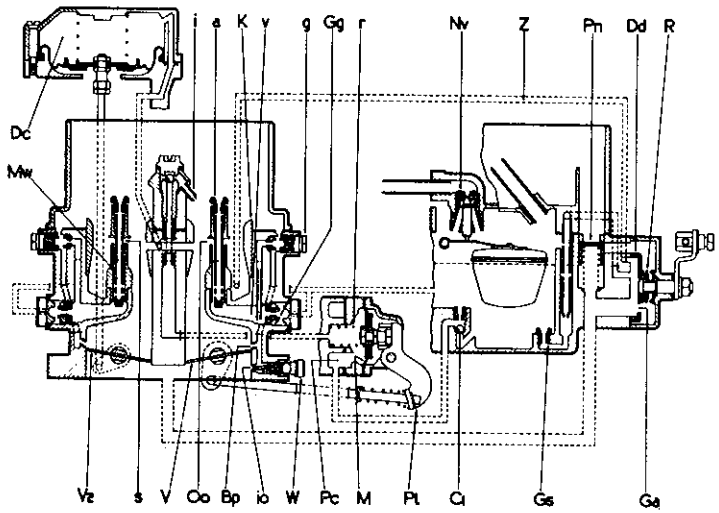


Fig. 14. Diagrammatic Section

Main Spraying System. This is in two parts, namely, primary and secondary circuits. As the throttle (V) is opened further and air speed through the venturi or choke-tube (K) rises, depression acting on spraying orifices (Oo) brings the main spraying circuit (primary) into operation. Under this condition petrol flows from the float-chamber and is metered by the main jet (Gg) before passing into the main spraying well where it mixes with air metered by the correction jet (a); the air entering the petrol stream by means of small holes in the emulsion tube. From the main well the mixture finally discharges through orifices (Oo) into the main air stream. As engine speed increases the petrol level in the well (Mw) drops and uncovers the remaining holes in the emulsion tube, thus allowing a greater quantity of air to enter the petrol stream to correct the output from the main jet according to engine speed and load.

The secondary main spraying circuit comes into operation when depression in the waist of the primary choke-tube reaches a certain value and opens throttle (V2) via the depression unit (Dc) and connecting rod. The main jet, air correction jet and emulsion tube then follow the pattern of operation as described for the primary circuit. During the initial opening stages of throttle (V2) a discharge of mixture takes place from the by-pass orifice (similar to Bp—primary circuit).

The Accelerating Pump. The accelerating pump is mechanical in operation and consists mainly of pump membrane (M), pump spring (r), pump lever (Pl) and an actuating rod, the latter item being the connecting link between the primary throttle spindle and lever.

On depressing the accelerator pedal the movement of the actuating rod and lever displaces the pump membrane (M), and in so doing forces petrol through the calibrated pump injector tube (i) into the main air stream, thereby ensuring a condition of rapid, smooth acceleration. Non-return valve (Cl) prevents the petrol returning to the float chamber when the membrane (M) is displaced.

Petrol Level. The level of fuel in the float chamber is controlled by the slight rise and fall of the float, closing or opening the needle valve (Nv) to cut off or admit petrol from the fuel pump as required. The design of the mechanism ensures complete stability of the predetermined level, thus eliminating all need for routine checking. The float assembly, however, must be replaced immediately in the event of damage, in order to maintain the correct fuel level.

Solex (B.32 P.A.I.A.) Compound Carburettor Settings

Choke	23 primary	25 secondary
Main	112·5 primary	140 secondary
Air Correction jet	190 primary	190 secondary
Pilot	50 primary	50 secondary
Emulsion tube	70	70
Starter petrol jet	145	
Needle valve	1·75 spring loaded	
Needle valve washer	1 mm.	
Pump back bleed	Blank	

STARTING PROCEDURE

Initial Starting

Place mixture control in full-rich position. Switch on ignition, but do not touch the accelerator pedal whilst attempting to start the engine. The engine will start immediately the starter motor is operated and as soon as the engine gathers speed, move the mixture control in approximately one-quarter of its travel.

After this process it is recommended to drive away at a moderate speed (to allow engine lubricant to distribute), the mixture control being progressively moved to the "off" position as the engine warms up. Do not forget to move the mixture control to the full "off" position as soon as possible in order to avoid unnecessary fuel wastage and high consumption.

Hot Re-starting

Do not use the mixture control if the car has only been left for a short time and the engine is still reasonably warm. If the engine and ambient temperatures are high and it does not start at once, depress the accelerator pedal about one-third of its travel maintaining this position until the engine fires and runs. Do not pump the accelerator pedal.

Setting the Idling

Having made sure that there is no undue wear in the throttle spindle and bearings, that flange joints are tight, distributor and spark plug points are clean and set to Manufacturers' recommendations, the following adjustments are made with the engine warmed up:—

1. Set the throttle (slow-running adjustment) screw until the idling speed is approximately 600 r.p.m.
2. Unscrew the volume control screw (W) until the engine begins to hunt.
3. Screw it in again until the hunting disappears and the engine idles smoothly.
4. If the engine speed has risen reset the slow running screw to bring it back to about 600 r.p.m.
5. This may cause a slight resumption of hunting. If so, gently screw in the volume control screw (W) until idling is perfect. (Under no circumstances should (W) be screwed hard home.)

WEBER CARBURETTOR MODEL 40 DCOE 2

Normal Operation (Fig. 15)

The fuel arrives through the needle valve (1) to the bowl (4) where the float (3) controls the opening of the needle (2) in order to maintain a constant fuel level. Through the ducts (6) and the main jets (5), it reaches the emulsion tubes (12), from which, after having been mixed with the air corrector jets (11), through the pipes (10) and the nozzles (7), it reaches the carburation area consisting of the auxiliary Venturis (8) and chokes (9).

Idling Operation and Progressive Action (Fig. 16)

The fuel is carried from the bowl (4) to the calibrated holes of the idling jets (14) through the ducts (15). Emulsified with the air coming from the ducts (13), through the ducts (20) and the idling feed holes (18), adjustable by means of screws (19), the fuel reaches the carburettor floats below the throttles (17). From the ducts (20) the mixture can reach the carburettor throats also through the progression holes (16).

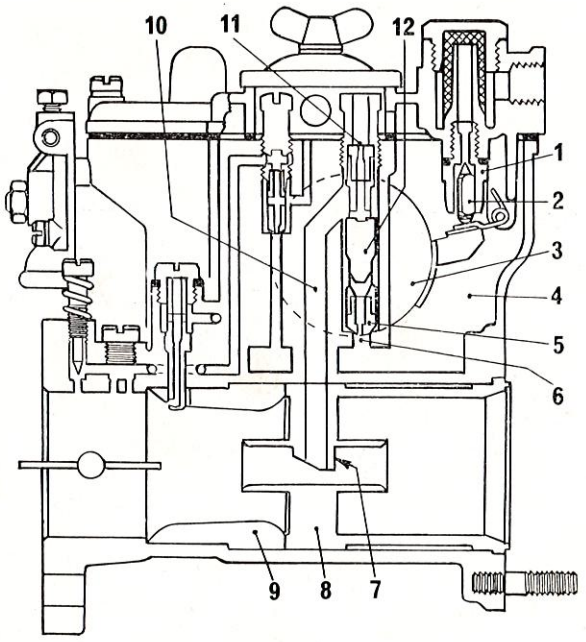
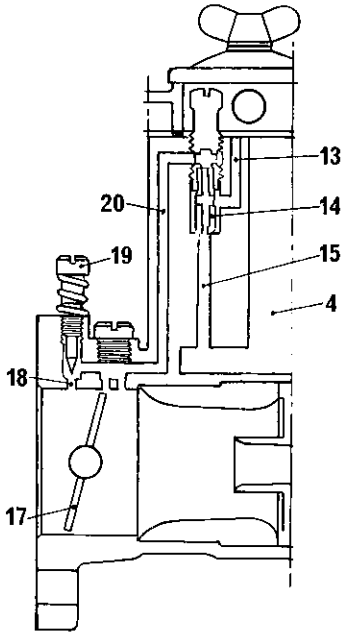


Fig. 15.



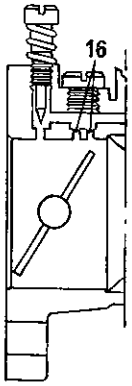


Fig. 16

Acceleration (Fig. 17)

By closing the throttle valves, the lever (25), by means of the shaft (27), lifts the piston (26). The fuel is thus drawn from the bowl (4) into the pump cylinder through the suction valve (23). By opening the throttles, the shaft (27) is free and the piston (26) is pushed down under the action of the spring (28); by means of the ducts (22) the fuel is injected through the delivery valve (21) to the pump jets (24) into the carburettor throats. The inlet valve (23) is provided with a calibrated hole which discharges the excess fuel delivered by the accelerating pump into the float bowl.

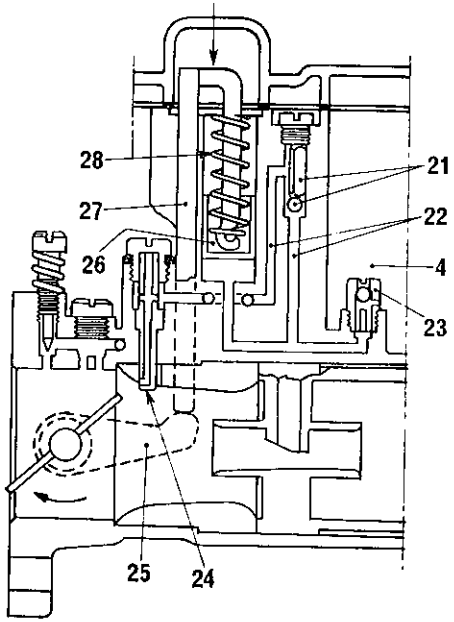
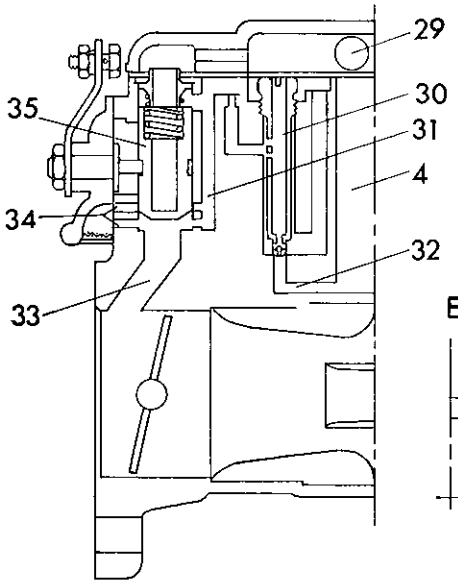


Fig. 17



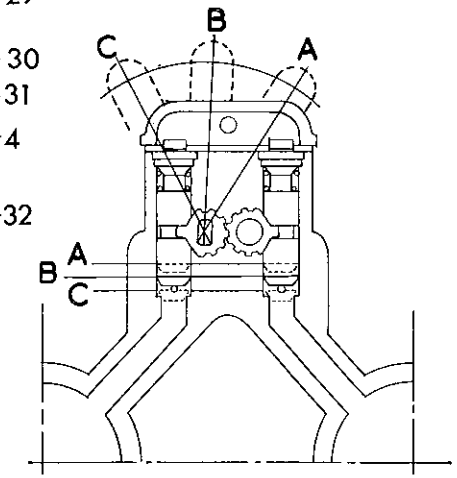


Fig. 18

Starting Device (Fig. 18)

The fuel flowing from the bowl (4) arrives to the starting device through the ducts (32) and the starting jets (30). Emulsified with the air coming from the hole (29) it reaches the valves opening (25) through the ducts (31) and, definitely emulsified by air entering from orifices (34), is then carried by means of the ducts (33) to the carburettor throats below the throttles.

Engine cold starts — starting device **inserted** — position "A".

Engine half-warm starts — **partial insertion** of the device — position "B".

Engine warm-up — during engine warm-up, even if the vehicle is under way, the starting device **must be gradually pushed into rest position.**

Engine normal running — starting device must be **pushed back** as soon as the engine has reached the operating temperature — position "C".

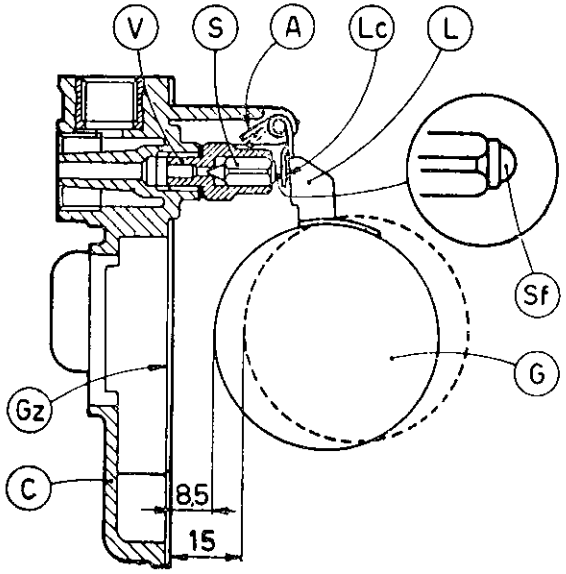


Fig. 19

Directions for Levelling the Float (Fig. 19)

It is essential that the following directions be complied with in order to obtain correct levelling of the float:—

— Make sure that the weight of the float (G) be the correct one (gr. 26), that the float can freely slide on the axis and does not show any pit.

— Make sure that needle valve (V) is tightly screwed in its housing and that pin ball (Sf) of the damping device, incorporated in the needle (S), is not jammed.

— Keep the carburettor cover (C) in vertical position as indicated in Fig. 19 since the weight of float (G) could lower the pin ball (Sf) fitted on the needle (S).

— With carburettor cover (C) in vertical position and float clip (Lc) in light contact with the pin ball (Sf) of the needle (S), the distance of both half-floats from upper surface of carburettor cover (C) with gasket (Gz) in its place, must measure 8,5 mm.

— After the levelling has been done, check that the stroke of float (G) is 6,5 mm. If necessary, adjust the position of the lug (A).

— In case float (G) had not been rightly set, rectify the position of float clip (Lc) till the required quota is reached, taking care that clip (Lc) does not show any pit on the contact surface that could affect the free sliding of the needle (S).

— Fit the carburettor cover making sure that float can move without any hindrance or friction.

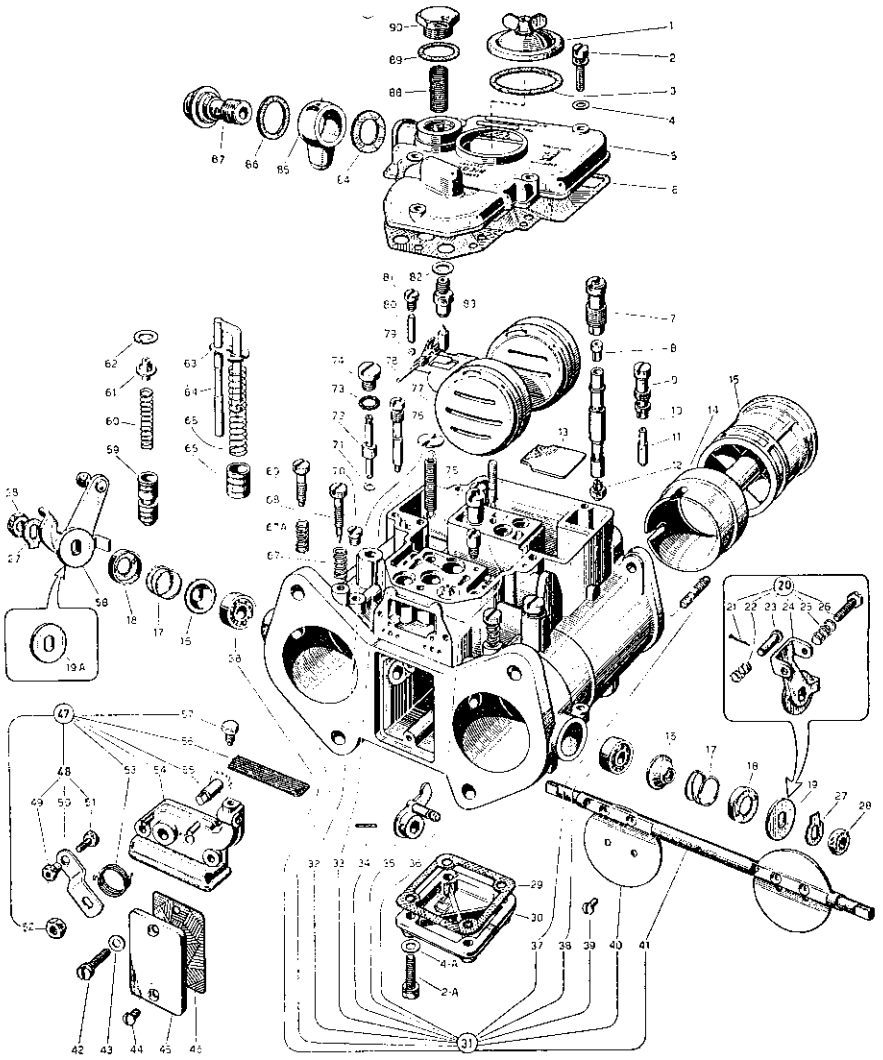


Fig. 20. Exploded view of Weber Carburettor

Key to Fig. 20

Description	No. off	Ref. No.	Key No.
Jet Inspection Cover	1	4629a	1
Cover Fixing Screw	5	665	2
Fixing Screw	4	665	2A
Gasket	1	2808	3
Washer for Screw	5	1356	4
Washer for Screw	4	1356	4A
Carburettor Cover	1	5813a	5
Gasket for Carburettor Cover	1	4611	6
Emulsioning Tube Holder	2	TS868	7
Air Corrector Jet	2	969*	8
Idling Jet Holder	2	1590	9
Emulsioning Tube	2	TS671*	10
Idling Jet	2	974*	11
Main Jet	2	TS195*	12
Plate	1	4610	13
Choke	2	4606a*	14
Auxiliary Venturi	2	4603a*	15
Dust Cover	2	5802	16
Spring	2	5803	17
Small Lid for Spring Retainer	2	5804	18
Distance Washer (Rear Carburettor)	1	5797	19
Distance Washer (Front Carburettor)	1	5797	19A
Throttle Control Lever, Complete (Front Carburettor) including:	1	5766a	20
— Split Pin	1	133	21
— Spring	1	5753	22
— Pin	1	5752	23
— Throttle Control Lever	1	5923a	24
— Spring	1	38	25
— Screw	1	1843	26
Lock Washer	2	4612	27
Fixing Nut	2	2706	28
Gasket	1	4617	29
Bowl Bottom Small Lid	1	4616	30
Carburettor Body including:	1	5812a	31
— Plate for Spring	1	4636	32
— Shaft Return Spring	1	TS1306	33
— Spring Pin	1	1349	34
— Pump Control Lever	1	5809a	35
— Stud Bolt	1	5420	36
— Stud Bolt	2	A1359	37
— Ball Bearing	2	5801	38
— Throttles Fixing Screw	4	3718	39
— Throttle	2	TS776	40
— Throttle Shaft	1	5800	41
Screw Securing Support	2	1153	42
Washer for Screw	2	2496	43
Fixing Screw	2	18	44

Key to Fig. 20

Description	No. off	Ref. No.	Key No.
Plate	1	4614	45
Gasket	1	4615	46
Starting Control including:	1	4609a	47
— Starting Control Lever with:	1	5875a	48
— Nut for Screw	1	4103	49
— Starting Control Lever	1	5784	50
— Screw Securing Wire	1	4102	51
— Lever Fixing Nut	1	335	52
— Lever Return Spring	1	4368	53
— Sheath Support Cover	1	4855a	54
— Starting Shaft	1	4650a	55
— Strainer	1	4647	56
— Screw Securing Sheath	1	3311	57
Throttles Control Lever (Rear Carburettor)	1	5767a	58
Starting Valve	2	4620	59
Spring for Valve	2	4621	60
Spring Guide and Retainer	2	4622	61
Circlip	2	4135	62
Spring Retainer Plate	1	5799	63
Pump Control Rod	1	5807a	64
Spring for Plunger	1	5816	65
Pump Plunger	1	5345a	66
Spring for Idling Mixture Adjustment Screw	2	38	67
Spring for Throttles Adjustment Screw (Rear Carb.)	1	38	67A
Idling Mixture Adjustment Screw	2	864	68
Throttles Adjustment Screw (Rear Carburettor)	1	970	69
Progression Holes Inspection Screw	2	5896	70
Pump Jet Gasket	2	5782	71
Pump Jet	2	5783*	72
Gasket	2	5796	73
Screw Plug	2	5781	74
Inlet Valve	1	2948a*	75
Starting Jet	2	3492*	76
Float	1	5674a	77
Pivot	1	1829	78
Valve Ball	2	756	79
Stuffing Ball	2	TS1033	80
Screw for Stuffing Ball	2	337	81
Gasket for Needle Valve Seat	1	1975	82
Needle Valve Seat	1	5330a/m*	83
Gasket for Fuel Filter Casing	1	TS610	84
Fuel Filter Casing	1	1687	85
Gasket for Fuel Filter Casing	1	4083	86
Fuel Filter Bolt	1	1688	87
Strainer	1	4064	88
Gasket for Strainer Inspection Plug	1	4083	89
Strainer Inspection Plug	1	4063	90

* Calibrated parts

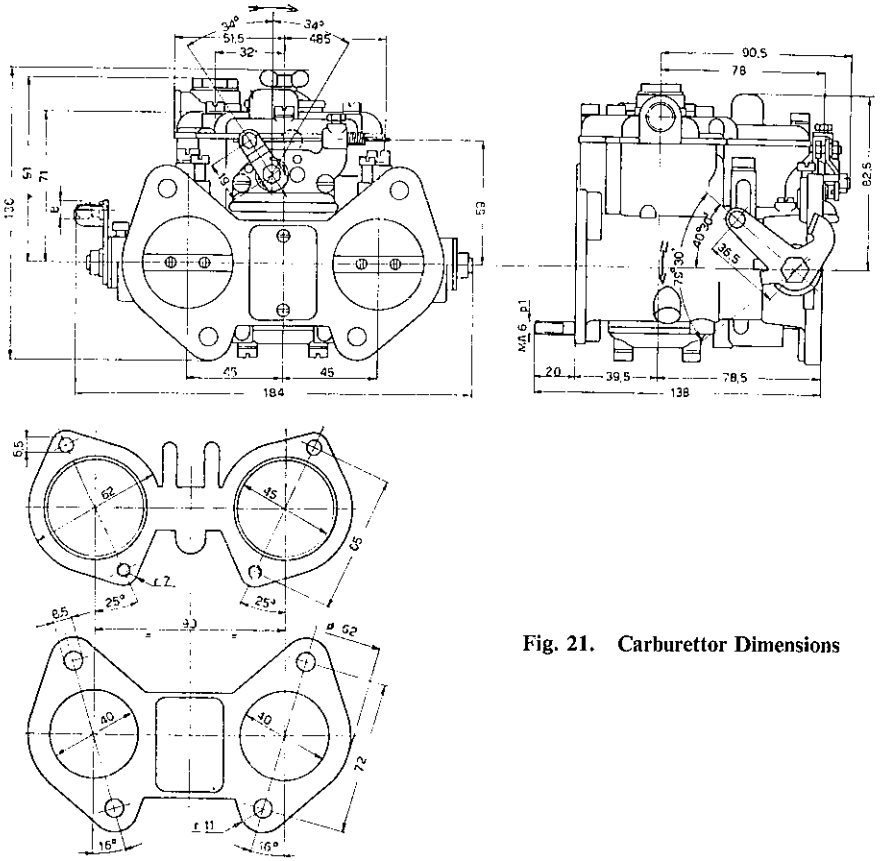


Fig. 21. Carburettor Dimensions

SETTINGS

Fig.	Q	*Key No.*	*Description*	*Summer* *Size in mm.*
14	2	4606a	Choke	33
15	2	4603a	Auxiliary Venturi	4,50
12	2	TS195	Main Jet	1.30
11	2	974	Idling Jet	50F8
72	2	5783	Pump Jet	0.40
76	2	3492	Starting Jet	60F5
10	2	TS671	Emulsioning Tube	F15
8	2	969	Air Corrector Jet	1.75
83	1	5330a/m	Needle Valve	2.0
75	1	2948a	Inlet Valve with Discharge Hole	0.55
77	1	5674a	Float (Weight)	26 gr.
—	—	—	Float level	8.5 mm.

OPTIONAL RECOMMENDATIONS

Engine Balance

Spitfire engine components are individually balanced to fine limits and selected to form matching sets. If a finer degree of balance is required for continuous high speed work, a worthwhile result will accrue from dynamically balancing the revolving parts, including the crankshaft, flywheel, clutch assembly and fan pulley, as an assembly. This operation counteracts minute discrepancies resulting from an accumulation of individual tolerances, and should be performed by specialists who have the necessary equipment.

Care should also be taken to ensure that the balanced assembly is suitably marked to facilitate the preservation of the original degree of balance after subsequent dismantling and assembly operations.

Renewal of pistons or connecting rods will necessitate rebalancing the piston to con-rod assemblies to ensure uniformity between them.

CRANKSHAFT HARDENING AND GRINDING

To prolong the life of the crankshaft and prevent minute scores resulting from particles of foreign matter in the lubricating oil, main bearing and connecting rod journals may be nitride or induction hardened, followed by micro-polishing. This hardening procedure, when desired, should be preceded by a crack test such as Magnaflux and should be entrusted to specialists in this work. Connecting rods and cap bolts should also be crack tested at the same time.

When grinding the Stage II crankshaft, Part No. 306549, it is extremely important to adhere rigidly to the fillet radii dimensions given on Fig. 22, as these differ from those of the standard crankshaft. Dimensions for grinding the standard crankshaft are given in the workshop manual, page 1·102.

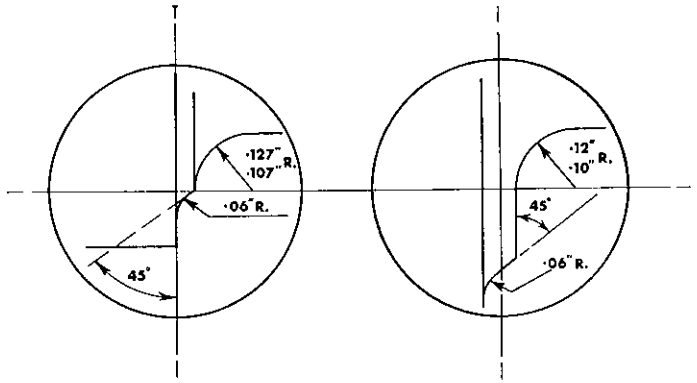


Fig. 22. Showing chamfer and radii dimensions on Stage II crankshaft (Part No. 306549) which must be adhered to when crank grinding is undertaken

Generator

Normal power losses can be reduced fractionally by fitting a larger generator pulley, Part No. 140945, and fan belt, Part No. 140946, to lower the speed of the generator.

Where maximum generator output is not required, such as for daylight racing, the generator load may be reduced by resetting the regulator to pass 2 to 3 volts, which is sufficient to meet requirements.

For long distance races and rally work, a larger vent fan, Part No. 102986, may be fitted to assist generator cooling.

Engine Cooling

For circuit racing only, when the absolute maximum engine power is required, slightly more of the available power can be used by removing the fan blades and the thermostat unit. An engine temperature of 85° to 90°C. should then be maintained by use of a radiator blind or by a suitable electrically driven fan. *The fan blades should not be removed for rally work.*

When refitting steel fan blades, it will be necessary to re-balance the pulley hub and fan assembly by adjusting the moveable balance weight provided. Rebalancing is unnecessary when refitting aluminium blades but being easily damaged, these blades must not be used to turn the engine.

Prior to racing, new fan belts should be stretched to prevent belt slip from causing reduced circulation of water and the consequent danger of over-heating.

Oil Cooler

Sustained high engine speeds at high ambient temperatures may increase the engine oil temperature above the recommended maximum limit of 100°C.

An oil pressure of 70 to 75 p.s.i. (cold) may drop to 30 to 40 p.s.i. when hot, and to maintain a desirable pressure of 50 p.s.i. at 2,000 r.p.m., it may be necessary to use oil of higher viscosity, or to fit an oil cooler.

In the circumstance, an oil cooler unit will assist in stabilising the oil temperature and pressure. The cooler is available in kit form complete with the high pressure hoses, unions, filter adaptor and mounting brackets. Fig. 23 shows the oil cooler unit mounted at the base of the radiator, between the frame members.

To Fit Oil Cooler Kit

Drain radiator, disconnect battery, water hoses and horn wires.

Remove radiator and radiator cradle.

Detach horns from cradle.

Drill two holes 11/32″ dia. in cradle positioned as shown on Fig. 24.

Loosely attach mounting brackets, Part Nos. 140472 and 140473, to the radiator cradle and replace cradle in chassis.

Mark off, through the slots in the brackets and drill 11/32″ dia. holes, $\frac{3}{8}$″ from the edge of the chassis member flanges.

Bolt bracket in position and secure oil cooler bolts.

Position the horns well forward of the oil cooler and facing inwards, such that they can be mounted by drilling $\frac{9}{32}$″ dia. holes $\frac{3}{8}$″ from the edge of the chassis member flanges.

NOTE : It may be necessary to remove the wiring clip on the L.H. chassis member.

Bolt on horns and rewire.

Refit radiator and hoses and refill.

Remove oil filter from engine.

Loosely attach adaptor, Part No. 130148 with the rubber seal towards the engine and the tab washer, Part No. 130142, under the central bolt head, Part No. 130141.

Screw taper end of unions, Part No. 140987, into the adaptor.

Attach the oil pipes as shown on sheet 1, from the adaptor to the oil cooler and position them such as to ensure they will not chafe on sharp or raw edges.

Tighten central adaptor bolt to a torque spanner reading of 20 to 25 lbs.ft. and secure with tab washer.

Tighten all pipe unions.

Replace oil filter and reconnect battery.

Run engine and then check oil level.

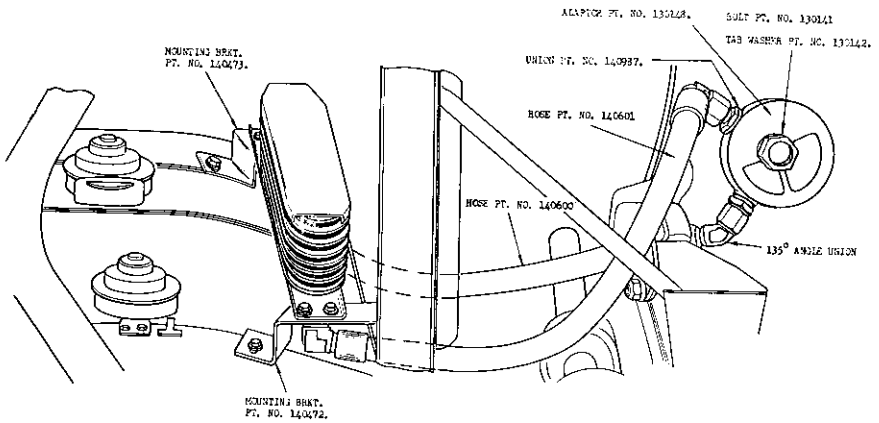


Fig. 23. Details of oil cooler arrangement

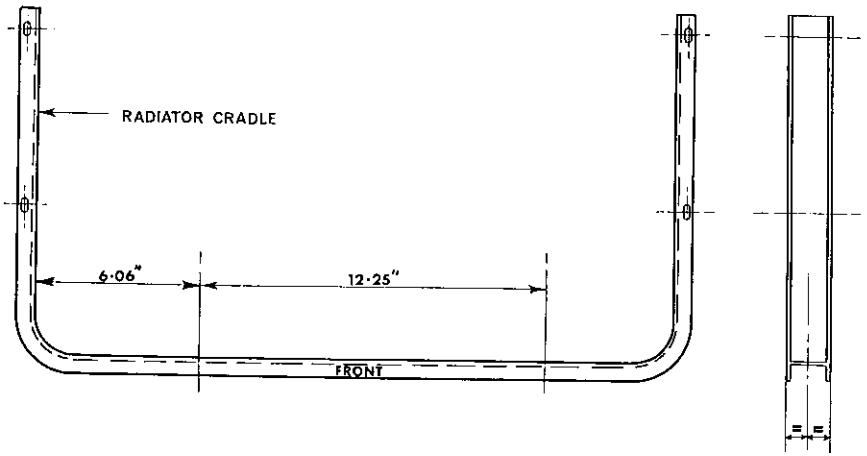


Fig. 24. Position of holes in radiator cradle

GIRLING POWERSTOP

Location

The unit may be fitted diagonally on the bulkhead ledge between the master cylinders and the windscreen washer bottle. The vacuum pot should face inboard towards the engine.

Fitting Procedure

1. Shape the brackets as shown on Fig. 26, taking care to keep the mounting faces flat.

2. Bolt the brackets to the Powerstop and offer in position on the bulkhead ledge to ensure that the unit will not foul or be fouled by any other part of the chassis, engine, or bonnet when closed.

3. Using the Powerstop and bracket assembly as a template, mark off for position and drill three holes for securing the brackets to the bulkhead ledge (Fig. 25.)

4. Bolt the Powerstop securely in position.

5. Connect the hydraulic pipes as shown on Fig. 27.

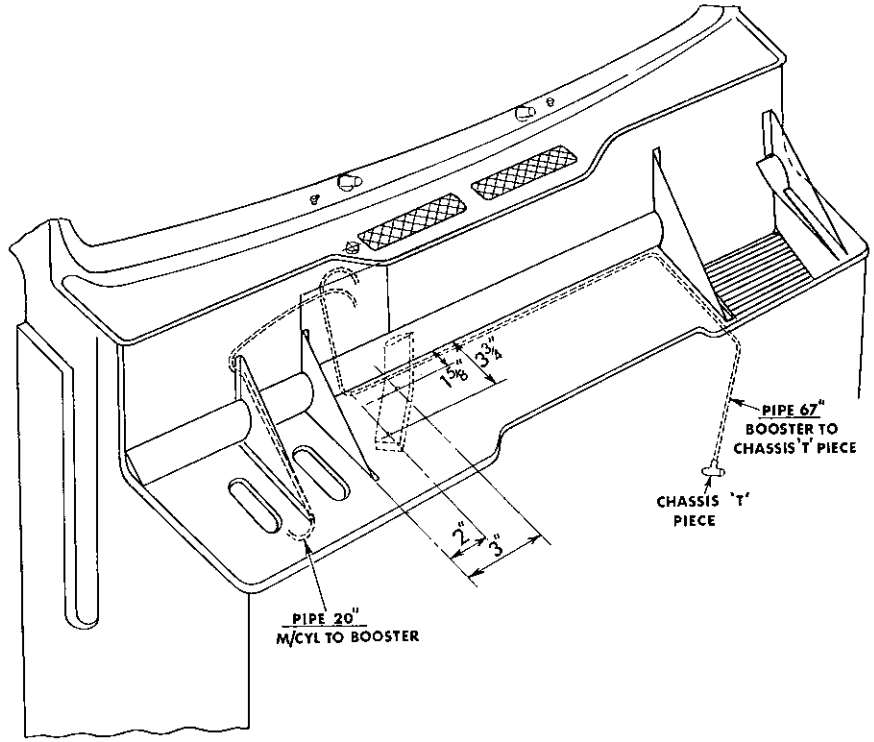


Fig. 25. Bulkhead shelf drilling location for lower power stop mounting bracket

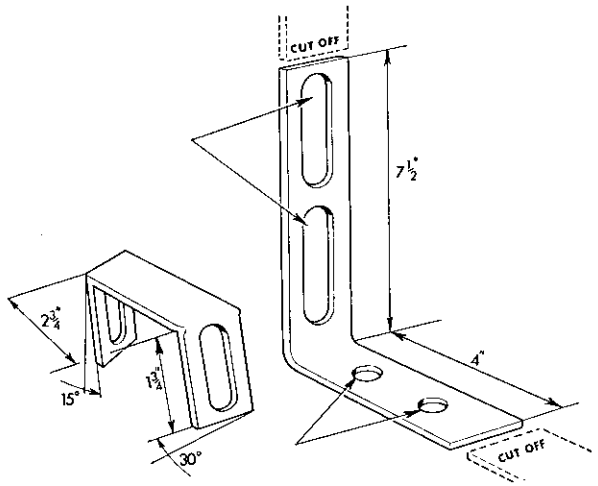


Fig. 26 Details of power stop mounting brackets

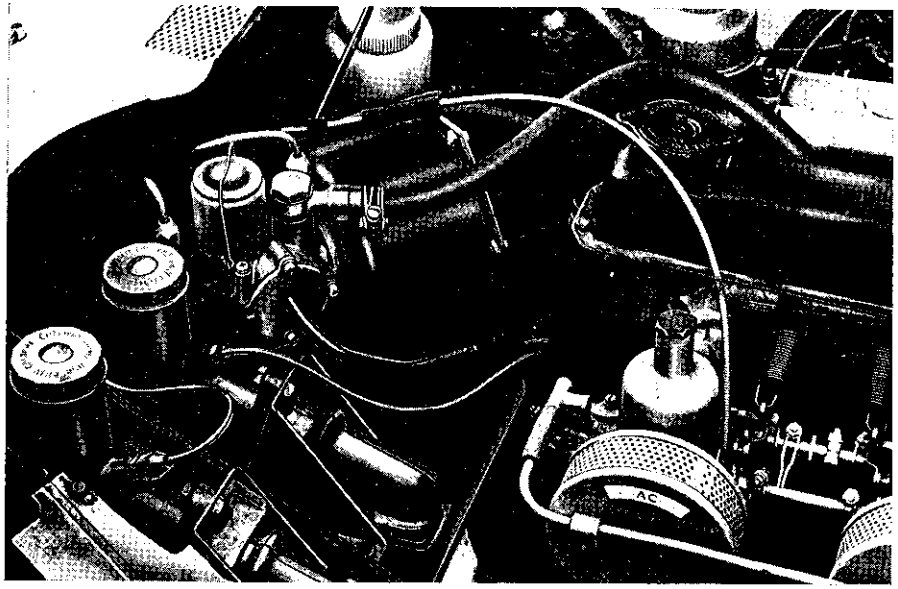


Fig. 27. Power stop installation

6. Remove the inlet manifold, drill the centre boss with a letter "R", drill and tap with a $\frac{1}{8}$" × 27 N.P.T. tap to suit the adaptor 64490295 contained in the kit.

7. Fit the banjo type non-return valve 64490204 to the vacuum port of the Powerstop and connect the vacuum hose between the non-return valve and inlet manifold adaptor. (The non-return valve contained in the kit is not used for this installation.)

8. Bleed the hydraulic system and check all connections for leakage.

9. Road Test the car.

Competition Brake Linings

Ferodo D.S.II heavy duty front pads are available for competition and racing purposes. They are identified by alternative blue and yellow markings on the side of the lining material.

Rear shoes to specification V.G.95/1 Ferodo and identified by blue marks on the ends and centre of each lining are available from the manufacturers for racing purposes only.

Being of a much harder material, these linings require increased pedal effort. This may be counteracted by fitting a "Power Stop" brake booster to the Girling brake system. The graph shown on Fig. 28 illustrates the relative pedal efforts required.

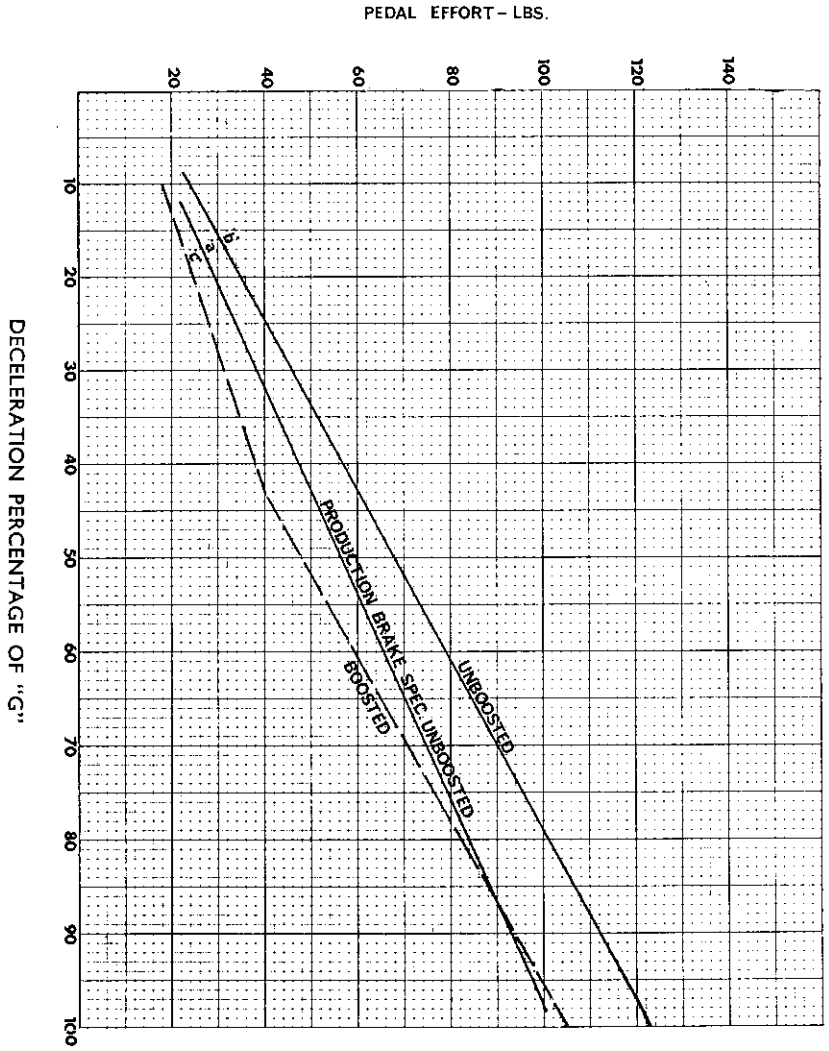


Fig. 28. Graph showing relative pedal efforts
(b) Competition linings unboosted (V.G. 95/1 rear and D.S.II front)
(c) As above, unboosted

SPITFIRE 4 FRONT ROAD SPRING DATA

Competition Front Road Springs

These are available under the following Part Nos.:—

For Rally and Competition (2 up), *i.e.*, driver and passenger—
Spring Part No. 209033 (Use in conjunction with rear spring Part No. 307027).

For Circuit Racing only (1 up), *i.e.*, driver only.
Spring Part No. 211869 (Use in conjunction with rear spring Part No. 306677).

Part No.	*Free Length*	*Fitted Length*	*Fitted Load*	*Rate*	*Identification*
209685	12·59″	7·80″ ± ·09″	718 lbs.	150 lb/in.	Green strip of paint on coils
210566	12·21″	7·42″ ± ·09″	718 lbs.	150 lb/in.	Light blue strip of paint on coils.
211869	9·95″	7·50″ ± ·09″	690 lbs.	282 lb/in.	Nil.
209033	10·97″	8·18″ ± ·09″	790 lbs.	284 lb/in.	Yellow.

Spring packings are available under Part No. 125441 to provide increased ground clearance. These should be restricted to one off per spring and fitted between the upper spring plate and suspension brackets. The packings are ⅜″ thick.

To reduce the front height of the vehicle, a spring, Part No. 209865, fitted to early vehicles, was superseded by a shorter spring, Part No. 210566. Legal requirements relative to headlamp height, however, necessitated the re-introduction of the earlier spring.

Particular springs and packings correspond with the following Commission Numbers:

Spring Part Number 209685	FC.1 to FC.3214
Spring Part Number 210566	FC.3215 to FC.39527.
Spring Part Number 210566 & Packing Part No. 125441	FC.39528 to FC.50564.
Spring Part Number 209685	FC.50565 and future.

Spring Dampers

Adjustable type dampers, manufactured by Armstrong Patents Co. Ltd., Eastgate, Beverley, Yorkshire, are recommended for competition use. These units have an external adjusting knob which may be turned to provide alternative settings without removing the unit from the vehicle. Their Part Numbers are as follows:

Front Damper (less road spring) ..	AT.9/A.2697
Rear Damper	AT.9/A.2612

Refer also to Spitfire 4 accessories brochure for Stanpart competition dampers.

SPITFIRE 4 REAR ROAD SPRING DATA

Competition Rear Road Springs

These are available under the following Part Nos.:—

For Rally and Competition (2 up), *i.e.*, driver and passenger.
Spring Part No. 307027 (Use in conjunction with front spring Part No. 209033).

For Circuit Racing only (1 up), *i.e.*, driver only.
Spring Part No. 306677 (Use in conjunction with front spring Part No. 211869).

Part No.	*Blade Thickness*	*No. of Blades*	*Laden Camber*	*Load*	*Rate*
305894	0·2188″	7	1·88″ neg. ± ·13″	945 lbs.	166 lb/in.
305894	0·2188″	7	1·88″ neg. ± ·13″	862 lbs.	166 lb/in.
{ modified as detailed below as an alternative to spring Part No. 306677.					
307025	0·2188″ 4 off 0·3125″ 3 off	Total No. 7	2·38″ neg.	813 lbs.	290 lb/in.
306677	0·2188″	No. 7	1·88″ neg.	821 lbs.	166 lb/in.

To achieve maximum road holding, for racing purposes only, the rear road spring Part No. 305894 may, as an alternative to fitting spring Part No. 306677, be modified to give a 3½° NEGATIVE CAMBER in racing trim, start line condition as follows:

Remove the spring from the vehicle and remove the clips which bind the spring leaves together. Counting the main leaf as number one, reverse the clips on the leaf. This will involve reversing the clips on the leaf and grinding flush the convex dimple locating the rubber buttons at the ends of the leaf. If the vehicle is considerably lightened for sprint work and short circuit racing and when a full fuel tank is not required for start line conditions, it may be necessary to reverse other leaves to achieve the desired 3½° NEGATIVE CAMBER.

The above modification is not recommended for normal road use.

WHEELS AND TYRES

Wheels

Improved road holding stability will result by increasing the wheel rim section from the standard specification of 3½D to a larger section 4½J. The fitting of alloy road wheels will reduce the unsprung weight and provide further improvement in road holding stability.

A light alloy road wheel of 4½J rim section is available under Part No. 306956. These wheels are also obtainable in kits, Part No. 514069, which include the special nuts, Part No. 104610, required when fitting the alloy wheel

A steel road wheel of 4½J rim section is available under Part No. 305985.

Wheel Balance

Special balance weights are required for alloy wheels. These are available under the following Part Numbers:

½ oz. 141961	1½ oz. 141963	2½ oz. 141965
1 oz. 141962	2 oz. 141964	3 oz. 141966

For high speed work it is strongly recommended that the wheel/tyre assembly be dynamically balanced and periodically checked for balance as tyre wear takes place.

Tyres

Tyre pressures will alter according to temperature variations, those quoted in the table below are correct at normal workshop temperature and are unaffected by wheel rim size.

Maintenance of pressure differential between front and rear tyres is essential for correct steering behaviour. When new tyres are required it is essential to fit those of the same type. Characteristics of tyres vary considerably and therefore the four tyres must be of the same type.

For additional safety under arduous operating conditions tubes may be fitted.

WARNING : Tubes must be used, regardless of tyre size or type, when light alloy wheels, Part No. 306596, are fitted.

Recommended Tyre Pressures (p.s.i.)

Tyre size and type	*For sustained speeds up to 80 m.p.h. and short bursts up to 90 m.p.h.*		*For sustained speeds up to 90 m.p.h. and short bursts up to maximum speed*		*For sustained speeds in excess of 90 m.p.h.*	
	Front	*Rear*	*Front*	*Rear*	*Front*	*Rear*
5·20 — 13 C.41	18	24	24	30	28	34
145/5·5 — 13 S.P.	21	26	21	26	21	26

For competition use only, S.P. pressures may be increased to 25 p.s.i. front and 30 p.s.i. rear.

NOTE : Where the vehicle is to be used at sustained speeds in excess of 90 m.p.h. or if the vehicle is tuned to increase its maximum speed, S.P. tyres should be used. They are satisfactory at the pressures recommended above, up to sustained speeds of 110 m.p.h. For sustained speeds above 110 m.p.h. or where the vehicle is to be used for racing, consult the respective tyre company regarding the need for tyres of full racing construction.

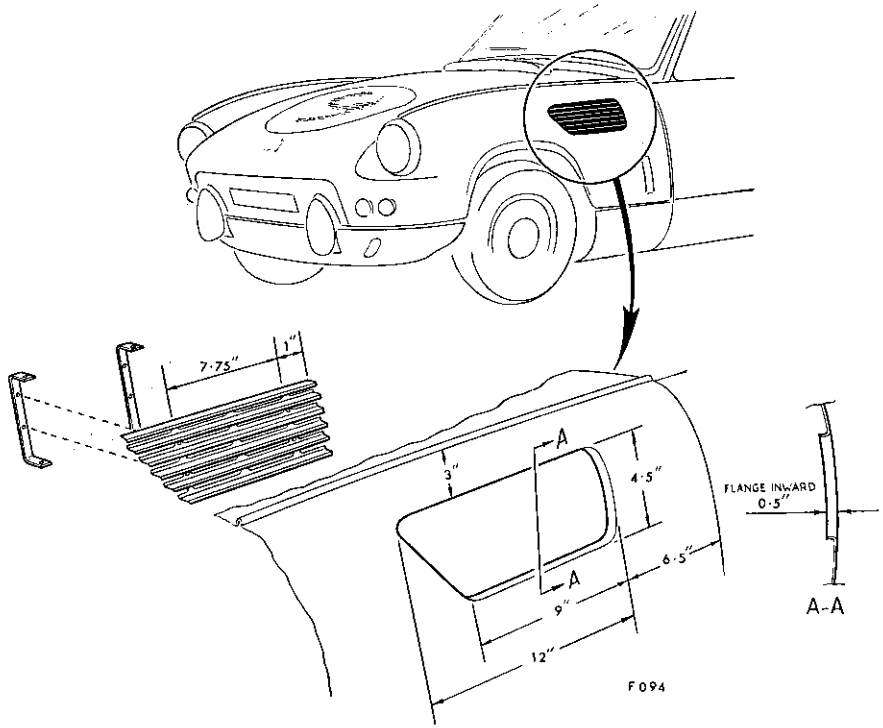


Fig. 29

"LE-MANS"

BONNET VENTILATING GRILLE

High under-bonnet temperatures, which may arise during a long-distance race or rally, may be considerably reduced by the addition of the "Le-Mans" bonnet ventilators.

Fig. 29 details the positioning of the apertures in the bonnet. Support brackets for the grille piece may be shaped from 18 S.W.G. × ¾" steel.

The grille piece may be cut from T.2000 radiator grille, part number 807462 and attached to the support bracket by rivets. It may be necessary to relieve the inside portion of the fluted section of grille piece to clear the windscreen wiper motor when closing the bonnet.

Rear Axle Ratios

The standard production rear axle ratio is 4·11 : 1. Alternative ratios are available as crown wheel and pinion sets under the following part numbers. The fitment of alternative ratios will require a correction of the speedometer. Calibrated speedometers are not available for the alternative ratios at the present time through normal spares channels.

4·11 (Standard production)	51005
3·89	514201
4·375	512453
4·55	502018
4·875	502017

HERALD 1200 AND 12/50 TUNING KITS

Herald and Spitfire models have common basic units, therefore, all Stanpart materials marketed for the Spitfire 4, with the exception of competition springs and dampers, can be fitted to the Herald. (Refer to "Homologation" page 5). Page 4·103 of the Workshop Manual lists appropriate springs and dampers for Herald Models.

The following tuning kits, containing fitting instructions, are available for Herald 1200 and 12/50 Models.

	Standard Production Herald 1200 *Single Carb.*	*Herald* 1200 *Twin* 1⅛″ *S.U. Carb. Conversion*	*Herald* 12/50 *Twin* 1¼″ *S.U. Carb. Conversion*
Kit Part No. ..	—	511037	512596
Retail Price ..	—	£39 10s. 0d.	£39 10s. 0d.
Compression ratio	8 : 1	8·5 : 1	9 : 1
B.H.P.	43 at 4,500 r.p.m.	*60 at 5,800 r.p.m.	63 at 5,750 r.p.m.
Max. Torque lb.in.	775 at 2,250 r.p.m.	752 at 3,700 r.p.m.	804 at 3,500 r.p.m.
B.M.E.P. p.s.i.	139	135	144
	*With "pancake" type air cleaners.		

Fitting a 12/50 Kit to a Herald 1200

A 12/50 tuning kit can be fitted to a Herald 1200 but this conversion will require the following parts not included in the kit as they are already fitted to 12/50 models.

	Item	*Part No.*
1 off	Camshaft—this item is required only up to Engine No. GA.164890. Later engines are provided with the correct camshaft.	204490
1 off	Front exhaust pipe (up to Commission No. GA.80001) ..	304213
1 off	Front exhaust pipe (after Commission No. GA.80001) ..	306443

In addition to machining the cylinder head to provide a compression ratio of 9 : 1, it will also be necessary to machine the inlet ports to 1·248″ - 1·252″ dia. for a depth of 0·38″ to accept the inlet manifold locating sleeves.

The basic differences between the 1200 and 12/50 tuning kits apply to compression ratios, ignition distributors and carburettors.

The details are as follows:

Compression Ratios

The standard compression ratio of 8 : 1 is raised to 8·5 : 1 for the 1200 tune, and to 9 : 1 for the 12/50 tune.

Ignition Distributor

The standard distributor, Part No. 208968, is suitable for the 1200 conversion at 8·5 : 1 compression ratio. A new distributor (Part No. 209697), included in the 12/50 kit, is needed for a compression ratio of 9 : 1.

Carburettors

Twin S.U. 1⅛″ carburettors are supplied in the 1200 kit and S.U. 1¼″ carburettors in the 12/50 kit.

Valves

Both the 1200 and 12/50 tuning kits contain valves using split cone spring retaining collars. This type of valve must be used when the high lift camshaft supplied in either tuning kit is fitted.

Warranty

The fitting of factory Stanpart twin carburettor conversion kits, disc brakes, conversion kits and other factory accessories detailed and specified for use on Herald Range will not invalidate or affect the vehicle warranty in any way. Should the fitting of Spitfire tuning equipment as detailed within this booklet be contemplated, your attention is drawn to the warranty position with regard to engine tuning parts specified for Spitfire as outlined within this booklet under the heading "Warranty", page 6.

HERALD 12/50 TWIN CARBURETTOR CONVERSION KIT

Part No. 512596

Introduction

This Kit contains all necessary components for converting a Herald 12/50 engine to Spitfire 4 engine specification.

To achieve maximum performance, the existing cylinder head must be machined to raise the compression ratio to a nominal 9 : 1.

The initial dismantling stage in the conversion is to remove the cylinder head from the engine as for "Top Overhaul" (decarbonising and valve grinding), then remove all ancillary components from the cylinder head:—

Water pump assembly;
Manifold and carburettor assembly;
Valves and springs;
Valve guides;
Heater union;
All studs, and the rocker oil feed plug from the rear of the cylinder head.

Machining and Re-assembling the Cylinder Head (Fig. 31)

Note : Bracketted numbers refer to items in Kit Part No. 512596.

1. Machine the bottom face of the cylinder head to give a combustion chamber depth of 0·430″ (10·9 mm.).
2. Wash the cylinder head in paraffin and blow off with compressed air to remove abrasive particles.
3. Refit the rocker oil feed plug.
4. Press the valve guides into the cylinder head.
5. Refit all manifold and rocker shaft studs to the cylinder head and attach the heater union.

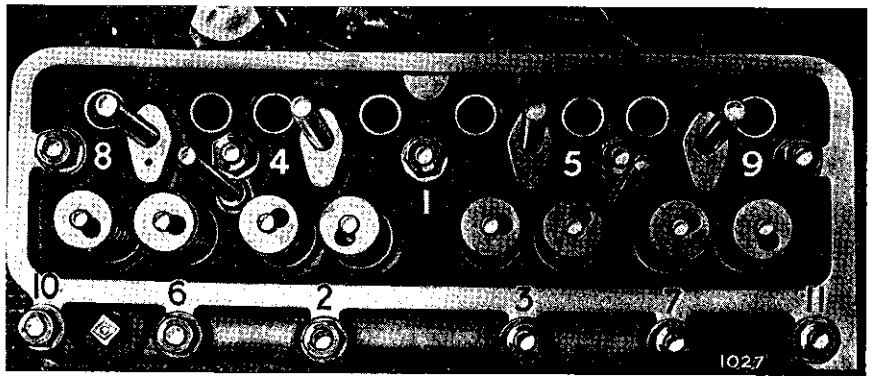


Fig. 30.

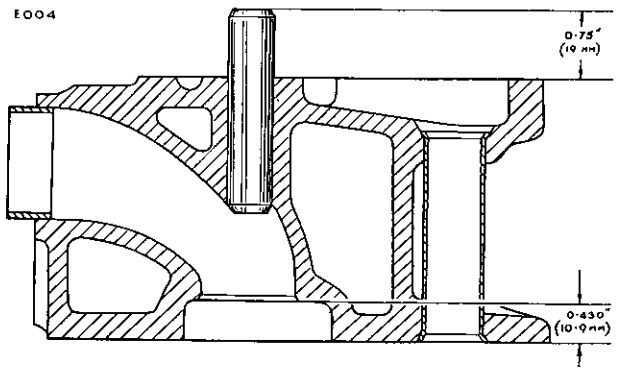


Fig. 31

6. Smear the threads of the rocker cover studs with jointing compound, assemble them to the head and secure with locknuts.
7. Position the new inlet valves (6) and exhaust valves (7) to their respective seats. Grind in the valves and thoroughly remove all grinding paste.
8. Secure the valves by assembling the lower collars (8), valve springs (9) (closed coils nearest the cylinder head), upper valve spring collars (10) and split cone cotters (11).
9. Assemble the water pump to the cylinder head with a new joint (3).

Assembling the Carburettors and Manifolds (Fig. 32)

1. Fit the front exhaust pipe studs (13) to the exhaust manifold (12).
2. Fit the locating sleeves (25) into the inlet manifold ports and the studs (17) to the bosses on the inlet manifolds.
3. Attach the inlet manifolds (14) and (15) to the exhaust manifold and secure with nuts (22) and spring washers (23). Do not fully tighten these nuts until after the manifold assembly complete has been fitted to the cylinder head.
4. Fit the balance pipe (18) and abutment bracket (41) to the inlet manifolds (14) and (15), interposing gaskets (19), and locate with bolts (20) and spring washers (21).
5. Fit the studs (16) to the inlet manifolds (14) and (15).
6. Fit the compound joints (38) to the inlet manifold flanges and assemble to them the front carburettor (29) and rear carburettor (30) securing with spring washers (40) and nuts (39). Do not fully tighten nuts until after carburettor connecting spindles have been fitted.

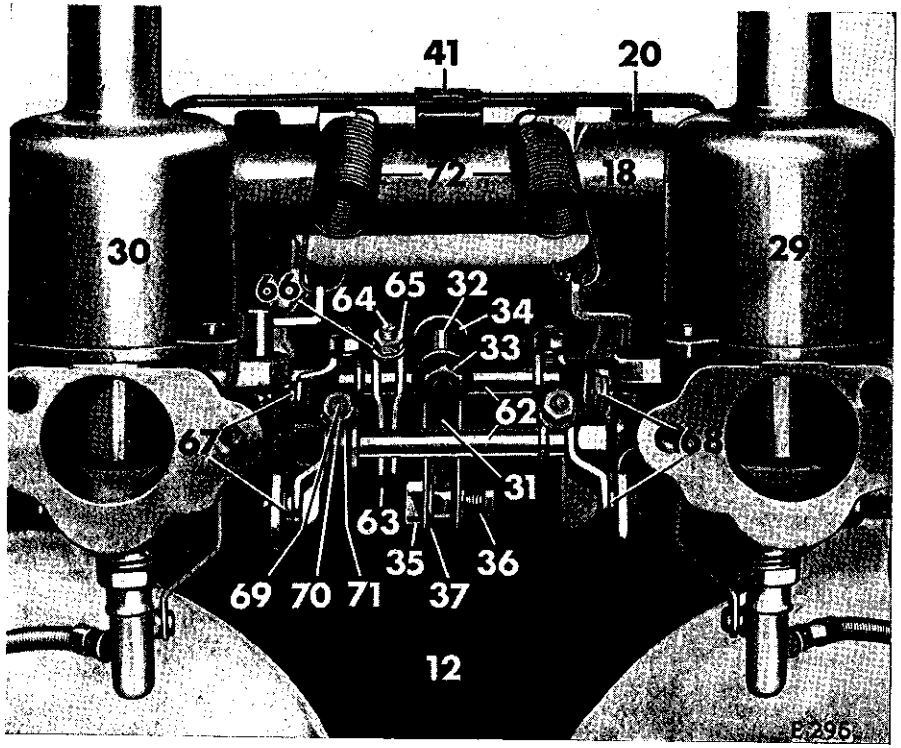


Fig. 32

7. Assemble to one of the connecting spindles (62): a lever pin assembly (67) complete with bolt, nut, and washer (69, 70 and 71); throttle stop lever (63), complete with bolt, nut and washer (64, 65 and 66); throttle lever (31), complete with bolt, nut and plain washers (32, 33 and 34); lever pin assembly (68), complete with bolt, nut and washer (69, 70 and 71). Fit this assembly between the two carburettors. Notice that the lever pin assemblies (67 and 68), though interchangeable, are handed so that the clamping nuts (70) may always be accessible from above the assembly when fitted to the engine.

8. Take the other connecting spindle (62) and assemble to it lever pin assemblies (67 and 68). Fit this assembly between the two carburettors to connect the two choke (jet movement) devices.

9. Fit the two throttle return springs (72), and tighten the carburettor securing nuts (39).

10. Fit the complete manifold and carburettor assembly to the cylinder head, together with manifold gasket (24), securing with clamps (28), spring washers (27) and nuts (26). Tighten the nuts (22) securing the inlet manifolds to the exhaust manifold.

Refitting the Cylinder Head (Fig. 30)

Refit the cylinder head to the engine block using a new head gasket (4), and plain washers (5) under the securing nuts in place of those previously fitted.

Continue to re-assemble as for a "Top Overhaul" (decarbonising and valve grinding) using the new exhaust flange gasket (2) and the new rocker cover gasket (1) if necessary.

Distributor and Ignition Timing (Fig. 34)

1. Remove the existing distributor complete with H.T. leads.

2. Fit the new distributor (53) and connect the L.T. wire. The driving dog on the distributor is offset, so the distributor cannot be wrongly fitted.

3. Slacken the distributor clamp plate bolt and fully retard the distributor advance thumbscrew against the direction of the arrow on the vacuum control housing. Turn the engine over until the T.D.C. marks (hole in the fan pulley and pointer on timing cover) coincide. Switch on the ignition and turn the distributor body against direction of rotation, *i.e.*, clockwise until the contact breaker points are seen or heard to break. Tighten the clamp plate bolt and switch off the ignition. Turn the distributor advance thumbscrew in the direction of the arrow on the vacuum control housing for thirteen distinct "clicks" (one "click" = 1 degree). The static ignition timing is now set correctly at 13° B.T.D.C. Fit the distributor cap and H.T. lead kit (46) and the thread protector (54) to the rev. counter take-off point of the distributor.

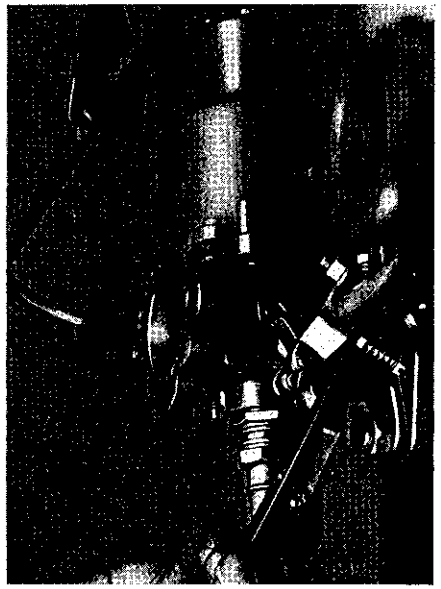


Fig. 33

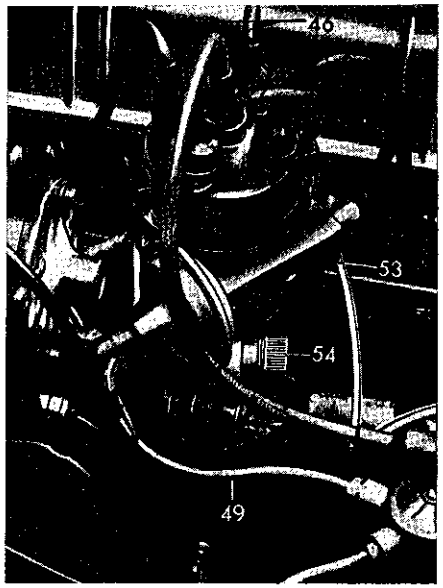


Fig. 34

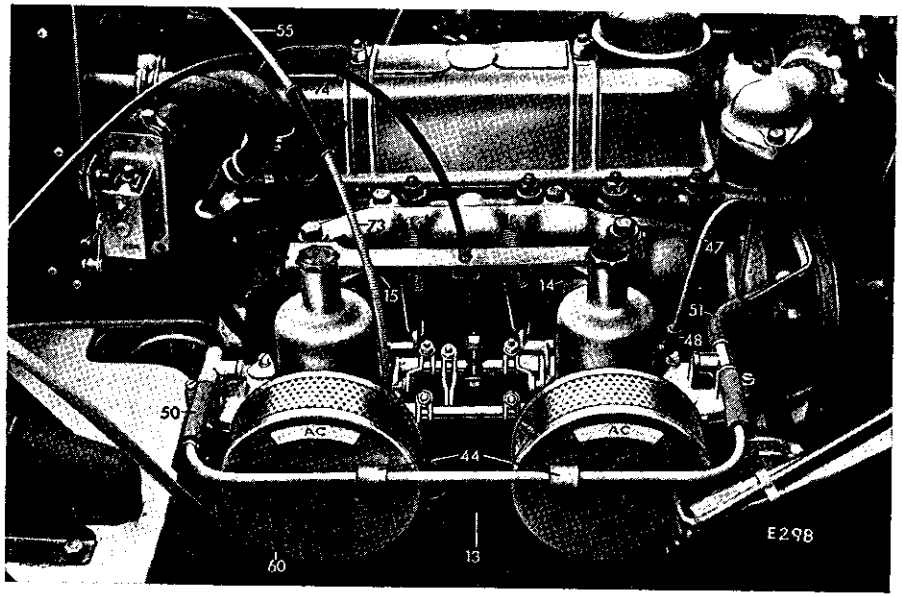


Fig. 35

Fuel Pipes and Vacuum Pipe (Figs. 34 and 35)

1. Remove the existing fuel feed pipe and distributor vacuum advance pipe. Fit the fuel pipe assembly (49) from the fuel pump to the front carburettor intake pipe on the engine side of the float chamber, using flexible pipe (51) to make the connection.

2. Connect the vacuum pipe (47) between the distributor and the front carburettor by means of rubber sleeve connectors (48).

3. Fit the fuel connection pipe (52) between the two carburettors, using flexible pipes (50) to make the connection.

Controls (Figs. 32 and 35)

1. Assemble the trunnion (35), bolt (36) and plain washer (37) to the throttle lever (31), connect the accelerator cable and tighten the bolt.

2. Remove the existing choke control cable assembly complete.

3. Fit the choke cable grommet (57).

4. Fit the main choke assembly (55) and assemble to the outer cable: a locking clip (74) and connecting sleeve (56), followed by a secondary outer cable (73), complete with a locking clip (74). Attach the choke inner cable to the lever on the rear carburettor, using pivot pin (43) and screw (42).

Tuning the Carburettors (Fig. 32)

1. Remove the dashpot dampers and fill each chamber with S.A.E.20 grade oil, and replace the dampers. The oil level is correct when the dampers stand approximately ¼″ above the dashpots before resistance is felt.

2. Screw the jet adjusting nuts up as far as possible, then unscrew them two complete turns (12 flats) each.

3. Start and warm up the engine. Slacken a clamping bolt on the throttle spindle coupling to permit the two throttle butterflies to be adjusted independently.

4. Adjust the throttle stop screws so that a thin piece of paper is just held between each screw and its stop, with the throttles held in the closed position. Then screw in the throttle stop screws one and a half turns each.

5. Start the engine and adjust the throttle screws by equal amounts until the engine idles at 500 to 600 r.p.m.

6. Check the synchronization of the throttle settings, using a length of rubber tube, by listening to the intensity of the air intake hiss of each carburettor, which should be equal. If not equal, slight adjustment of the throttle screws will achieve the desired condition.

7. Adjust the mixture strength by screwing the jet adjusting nuts up to weaken, or down to enrich, until satisfactory running is obtained. Idling speed may now have been affected and should be re-adjusted as described previously.

8. Check the mixture strength by lifting the piston of the front carburettor, using a penknife blade or small screwdriver, by approximately $\frac{1}{32}$″ (0·75 mm.) when:
   (a) If the engine speed increases, the mixture strength of the front carburettor is too rich;
   (b) If the engine speed immediately decreases, the mixture strength of the front carburettor is too weak;
   (c) If the engine speed momentarily increases and then settles down again, the mixture strength of the front carburettor is correct.

9. Repeat the operation at the rear carburettor.

10. The throttle on each carburettor is operated by a lever and pin with the pin working in a forked lever attached to the throttle spindle. A clearance should exist between the pin and fork which must be maintained when the throttle is closed, and the engine idling, to prevent any load from the accelerator linkage being transferred to the throttle butterfly and spindle. To set this clearance, move each throttle shaft lever downwards in turn until each lever pin rests lightly on a 0·015″ (0·38 mm.) feeler inserted between the pin and the lower arm of the carburettor throttle lever fork. Tighten the clamping bolt of the throttle shaft at this position and the clamping bolt of the throttle stop lever with the stop lever touching the choke spindle.

Jet and Choke Interconnection Adjustment (Fig. 33)

With the choke control fully "IN" and throttle closed, adjust the screw on the rear carburettor to give a clearance of 0·015″ (0·4 mm.) between the end of the screw and rocker lever.

Air Cleaners (Fig. 35)

Assemble clips (44) together with rubber sleeves (45) to the fuel connection pipe (52). Fit the air cleaners (58) to the carburettors, interposing joint washers (59). Secure the air cleaners and fuel pipe clips with bolts (60) and spring washers (61).

CONTENTS LIST

Kit Part No. 512596

Item No.	*Description*	*Part No.*	*Quantity*
1	Rocker Cover Gasket	105257 *or* 139029	1
2	Exhaust Flange Gasket	121595	1
3	Water Pump Joint	138702	1
4	Cylinder Head Gasket	207930	1
5	Plain Washer (Under Cylinder Head Nut)	WM0820	11
6	Inlet Valve	126893	4
7	Exhaust Valve	131179	4
8	Lower Valve Spring Collar	105118	8
9	Valve Spring	136487	8
10	Upper Valve Spring Collar	111870	8
11	Split Cone Cotter	106663	8 prs.
12	Exhaust Manifold	306212	1
13	Stud, Exhaust Manifold—Front Pipe	101962	3
14	Front Inlet Manifold	209947	1
15	Rear Inlet Manifold	209946	1
16	Stud, Manifold—Carburettor	107530	4
17	Stud, Inlet—Exhaust Manifold	56243	2
18	Balance Pipe	136830	1
19	Gasket, Balance Pipe—Inlet Manifold	136831	2
20	Bolt } Balance pipe & abutment	HB0814	4
21	Spring Washer } bracket to Inlet manifold	WL0208	4
22	Nut } Inlet to	HN2009	2
23	Spring Washer } Exhaust Manifold	WL0209	2
24	Manifold Gasket	118518	1
25	Locating Sleeves, Inlet Manifold—Head	112971	2
26	Nut } Manifolds	100498	6
27	Spring Washer } to	WL0209	6
28	Clamp } Cylinder Head	58258	4
29	Front Carburettor	510161	1
30	Rear Carburettor	510162	1
31	Throttle Lever	138227	1

Item No.	*Description*	*Part No.*	*Quantity*
32	Bolt } Throttle Lever to	HU0709	1
33	Nut } Carburettor	HN2007	1
34	Plain Washer } Throttle Spindle	WP0007	2
35	Throttle Lever Trunnion	134533	1
36	Bolt } Secure accelerator cable to	HU0504	1
37	Plain Washer } Throttle Lever trunnion	37417	1
38	Carburettor Joint Washer } Carburettor	134936	2
39	Nut } to Inlet	HN2009	4
40	Spring Washer } Manifold	WL0209	4
41	Throttle Outer Cable Abutment Bracket	138918	1
42	Screw } Choke Inner Cable	504003	1
43	Pivot Pin } to Carburettor	503999	1
44	Clip, Mounting Carburettor Fuel Connecting Pipe to Air Cleaner Inner Mounting Bolt	100148	2
45	Rubber Sleeve—Located in 44	114178	2
46	H.T. Lead Kit	511547	1
47	Vacuum Pipe, Carburettor—Distributor	209778	1
48	Rubber Sleeve Connector for 47	128262	2
49	Fuel Pipe Assembly, Pump to Front Carburettor	305946	1
50	Flexible Pipe, Joins Fuel Connection Pipe to Carburettor	120331	2
51	Flexible Pipe, Joins Fuel Feed Pipe to Front Carburettor	115783	1
52	Fuel Connection Pipe. Front to Rear Carburettor	134855	1
53	Distributor	209697	1
54	Thread Protector for Rev. Counter Take-off	138762	1
55	Choke Assembly	401446	1
56	Choke Outer Cable Connecting Sleeve	117400	1
57	Choke Cable Grommet	61917	2
58	Air Cleaner	134801	2
59	Joint Washer } Air Cleaner	130415	2
60	Bolt } to	HB0867	4
61	Spring Washer } Carburettor	WL0208	4
62	Carburettor Connecting Spindle	511747	2
63	Throttle Stop Lever	511748	1
64	Bolt } Attaching Throttle	108350	1
65	Nut } Stop Lever to	108325	1
66	Washer } Throttle Spindle	509108	1
67	Lever Pin Assembly, R.H.	511749	2
68	Lever Pin Assembly, L.H.	511750	2
69	Bolt } Connects Lever pins	108350	4
70	Nut } to Throttle and	108325	4
71	Washer } Choke Spindles	509108	4
72	Throttle Return Spring	136835	2
73	Secondary Outer Choke Cable	401447	1
74	Choke Cable Locking Clips	FX3203	2

HERALD 1200 AND 12/50 SPECIAL CONVERSIONS

Subject to the receipt of specific written instructions, the Standard-Triumph Service Division will undertake the fitting of Stanpart tuning kits, special accessories and any suitable item of optional equipment described in this booklet. They will also undertake any special work involved in the preparation of a car for rallying or competition events.

Owners who wish to purchase a new car built to a specification different from the standard form should direct their enquiries through a Standard-Triumph Distributor or Dealer and must conform with the following conditions:

All prices for conversion work detailed are *strictly nett* and are applicable only to new cars with inter-factory mileage delivered to Allesley, Coventry, direct from Car Release Despatch Department at the Fletchamstead Works.

Cars to be subjected to engine conversion must be equipped with disc brakes, which should be specified on the original order form placed with Standard-Triumph Sales Division.

Purchase Tax — Special Conversions

NOTE : To avoid payment of purchase tax for conversion work the following H.M. Customs and Excise requirements must be complied with in full.

(a) The Distributor/Dealer must have completed the sale of the car to the user customer and substantiate this by the provision of a specific user customer order accompanying the normal Distributor/Dealer order, which should detail the registration number and the commission number of the vehicle.

(b) Collection from Canley Car Release Department, Fletchamstead Works, and delivery to Service Department, Allesley, must be undertaken by the owner or his Agent, not Standard-Triumph personnel.

Special Service Division Conversions available which in no way affect the normal vehicle warranty

Conversion "A" Price £95 0s. 0d. nett. Consisting of:
Spitfire engine complete with clutch to current production specification. Vitesse instrumentation which includes separate speedometer, revolution counter, temperature gauge and fuel gauge. A free-flow twin chrome tail pipe silencer. A rear axle ratio of 4·55 : 1.

Conversion "A1" Price £165 0s. 0d. nett. Consisting of:
Conversion (A) plus Laycock "D" type overdrive operating on 3rd and top gears. Ratio 0·802 : 1. N.B. Overdrive only available with conversion (A).

Conversion "B" Price £65 0s. 0d. nett. Consisting of:
Current production specification Spitfire engine and clutch.

Conversion "C" Price £25 0s. 0d. nett. Consisting of:
Current production specification 12/50 engine and clutch.

Conversion "D" Price £15 0s. 0d. nett. Consisting of:
4·55 : 1 rear axle ratio.

PERFORMANCE DATA FOR SPECIAL CONVERSIONS A AND A1

Gearbox Ratios as 1200 — 12/50.
Rear Axle Ratio 4·55 : 1.
Overdrive, if fitted, 0·802 ratio. Laycock "D" type.
Figures in brackets denote m.p.h. speeds with radial ply types (Dunlop S.P. 145 × 13).
Tyres Dunlop 5·20 × 13.

Ratios to 1	*O/D Top* ·802	*Top* 1·0	*O/D 3rd* 1·12	*3rd* 1·39	*O/D 2nd* 1·73	*2nd* 2·16	*1st & Rev.* 3·75
Overall Ratios ..	3·65	4·55	5·09	6·35	7·88	9·83	17·06
Engine r.p.m. at road speed of 10 m.p.h.	565 (575)	705 (716)	790 (804)	985 (1000)	1220 (1240)	1520 (1550)	2640 (2680)
Road speed (m.p.h.) at 1000 r.p.m.	17·67 (17·4)	14·17 (13·9)					
Road speed (m.p.h.) at 5,500 r.p.m.	101·6 (100)	80·2 (79)	71·0 (70)	56·8 (55·8)	45·0 (44·2)	36·2 (35·6)	20·8 (20·4)
Road speed (m.p.h.) at 6,000 r.p.m.	111·6 (110)	87·9 (86·4)	78·1 (76·9)	62 (61)	49·2 (48·4)	39·4 (38·8)	22·7 (22·3)
Road speed (m.p.h.) at piston speed of 2,500 ft. min.	91·7 (90·0)	72·8 (71·5)					

All above road speeds are theoretical 5th wheel calculations taking into account tyre growth.

COMPARATIVE PERFORMANCE DATA

M.P.H. IN TOP GEAR	1200	12/50	VITESSE	1200 — 12/50 CONVERSION "A"
20 to 40	11·9	12	9·6	10·7
30 to 50	13·0	13	9·6	11·2
40 to 60	18·5	16·5	10·6	12·4
M.P.H. THROUGH GEARS				
0 to 50	17·5	14·5	12·0	10·9
0 to 60	27·5	21·5	17·1	16·3
MAX. Speed M.P.H.	77	81	89	87
B.H.P.	43	51	70	67

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