



**'MGA'**

**SPECIAL TUNING**



# 'MGA'

## SPECIAL TUNING

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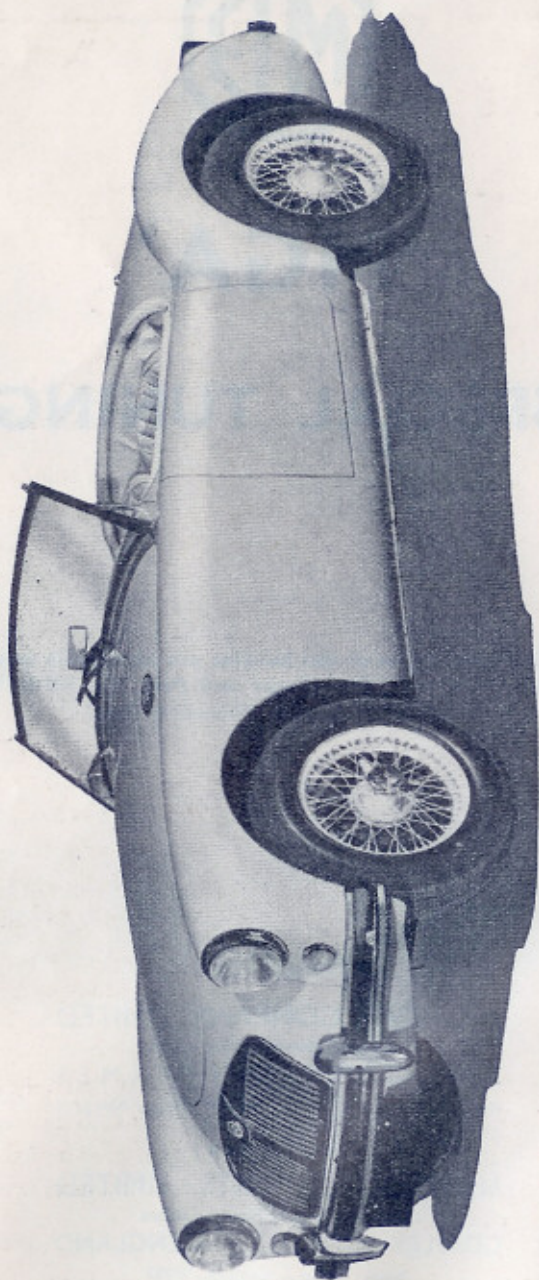
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THE 'MGA' TWO-SEATER (Series MGA)





## FOREWORD

This is another of the M.G. Tuning Booklets which have been issued in recent years. It deals specifically with the Series MGA.

The 'MGA' as delivered from the Factory in its standard form is tuned to give maximum performance with 90-octane gasoline consistent with complete reliability and reasonable freedom from pinking. There is, however, a more or less continuous demand from enthusiasts all over the world for information on methods of improving the performance for competitive purposes, and it is to meet this demand that this booklet has been prepared.

It must be clearly understood, however, that, whereas it is a simple matter to increase the power output of the engine, this increase in power must inevitably carry with it a tendency to reduce reliability. It is for this reason that the terms of the Warranty on a new M.G. expressly exclude any super-tuning of the kind described in this booklet, but this does not mean that tuning in this way will necessarily make the car hopelessly unreliable. In fact, it may be assumed that it will be at least as reliable as other cars of similar performance.

This booklet is laid out to give details for progressively increasing the power. With the above ideas firmly in mind, the owner should select the simplest tuning method which will give him the performance he requires, remembering all the time that here, as elsewhere, **Power Costs Money.**

Tuning hints are included for the racing enthusiasts who want to go to the limit and who have facilities to modify or make up special parts for their cars. We hope this section will be of use to them.



## GENERAL DATA

### Engine

Type .. ..	BPI5GB or I5GB/U/H
Number of cylinders	4
Bore .. ..	2.875 in. (73.025 mm.)
Stroke .. ..	3.5 in. (89 mm.)
Capacity .. ..	90.88 cu. in. (1489 c.c.)
Firing order ..	1, 3, 4, 2
Compression ratio ..	8.3 : 1
Capacity of combustion chamber (valves fitted) ..	38.2 to 39.2 c.c. (2.3 to 2.4 cu. in.)
Valve operation ..	Overhead by push-rod
Safe maximum r.p.m.	5,800
Valve crash r.p.m. ..	6,000
B.H.P. .. ..	72 at 5,750 r.p.m.
B.M.E.P. .. ..	133 at 3,850 r.p.m.
Torque (lb. ft.) ..	80.2 at 3,850 r.p.m.
Octane rating ..	Minimum requirements for knock-free operation 87-90 octane
Cooling system ..	Thermo-siphon, pump and fan-assisted
Enlarge bore	
First .. ..	.010 in. (.254 mm.)
Maximum .. ..	.040 in. (1.016 mm.)

### Crankshaft

Main journal diameter .. ..	2 in. (50.8 mm.)
Minimum regrind diameter .. ..	1.96 in. (49.78 mm.)
Crankpin journal diameter .. ..	1.8759 to 1.8764 in. (47.65 to 47.66 mm.)
Crankpin minimum regrind diameter	1.8359 in. (46.64 mm.)

### Main bearings

Number and type ..	3 Shell type
Material — bottom half .. ..	Steel-backed white metal
Material—top half ..	Steel-backed white metal
Length .. ..	1.375 in. (34.925 mm.)
End-clearance ..	.002 to .003 in. (.051 to .076 mm.)
End-thrust .. ..	Taken by thrust washers at centre main bearing
Running clearance ..	.0005 to .002 in. (.0127 to .0508 mm.)





### Connecting rods

Length between centres .. ..	6.5 in. (165.1 mm.)	
Big-end bearings		
Material—top half	Steel shell and lead-indium	} Part No. 1H717 marked 'VP'
Material—bottom half .. ..	Steel shell and lead-indium	
Bearing side-clearance .. ..	.008 to .012 in. (.203 to .305 mm.)	
Bearing diametrical clearance .. ..	.0001 to .0016 in. (.002 to .04 mm.)	

### Pistons

Type .. ..	Aluminium alloy
Clearances	
Bottom of skirt .. ..	.0017 to .0023 in. (.043 to .051 mm.)
Top of skirt .. ..	.0035 to .0042 in. (.090 to .106 mm.)
Oversizes .. ..	+ .010 in., + .020 in., + .030 in., + .040 in. (+ .254 mm., + .508 mm., + .762 mm., + 1.016 mm.)

### Piston rings

Compression: Plain	Top ring (chrome-plated)
Tapered	Second and third rings
Width .. ..	.111 to .118 in. (2.81 to 3.0 mm.)
Thickness .. ..	.0615 to .0625 in. (1.56 to 1.58 mm.)
Fitted gap .. ..	.008 to .013 in. (.20 to .33 mm.)
Clearance in groove .. ..	.0015 to .0035 in. (.038 to .089 mm.)
Oil control ring	Slotted scraper
Width .. ..	.1552 to .1562 in. (3.94 to 3.99 mm.)
Thickness .. ..	.111 to .118 in. (2.81 to 3.0 mm.)
Fitted gap .. ..	.008 to .013 in. (.20 to .33 mm.)
Clearance in groove .. ..	.0016 to .0036 in. (.040 to .091 mm.)

### Gudgeon pin

Type .. ..	Clamped
Fit .. ..	.0001 to .00035 in. (.0025 to .009 mm.) Hand-push fit at 68° F.
Diameter .. ..	.6869 to .6871 in. (17.447 to 17.4523 mm.)



## Cylinder head

Cylinder head depth	$3\frac{1}{8} + \frac{1}{8} - 0$ "
Thickness of cylinder head gasket ..	.035 in. (compressed) (Part No. IH696 up to Engine No. 15687) .029 in. (compressed) (Part No. IH1017 from Engine No. 15688)
Capacity of cylinder head gasket ..	3.73 c.c.
Capacity of combustion space ..	38.2/39.2 c.c. (valves fitted)
Capacity of piston head below block face ..	3.5 c.c.
Capacity of piston concavity ..	4.85 c.c.
Capacity of plug centre hole ..	.2 c.c.
Inlet and exhaust manifold gasket ..	Part No. IG2417
Valve seat angle in cylinder head ..	45°

## Valves and valve gear

Seat angle		
Inlet .. ..	45° up to Engine No. 4044 45½° from Engine No. 4045	} Seat angle in cylinder head 45°
Exhaust .. ..	45° up to Engine No. 4044 45½° from Engine No. 4045	
Head diameter		
Inlet .. ..	1.5 in. (38.1 mm.)	
Exhaust .. ..	1.281 in. (8.73 mm.)	
Stem diameter		
Inlet .. ..	.34175 to .34225 in. (8.74047 to 8.69189 mm.)	} Part No. IH653 up to Engine No. 23447
	.3422 to .3427 in. (8.69188 to 8.70458 mm.)	
Exhaust .. ..	.34175 to .34225 in. (8.74047 to 8.69189 mm.)	} Part No. IH1059 from Engine No. 23448
Valve lift .. ..	.357 in. (9.06 mm.)	
Exhaust .. ..	1.165 to 1.175 in. (29.6 to 29.8 mm.)	
Throat diameter		
Inlet .. ..	1.25 in. (31.75 mm.)	





### Valves and valve gear—continued

#### Valve stem to guide clearance

Inlet .. ..	.00155 to .00255 in. (.0375 to .0635 mm.)
Exhaust .. ..	.00105 to .00205 in. (.025 to .051 mm.) (up to Engine No. 4044)
	.00200 to .00300 in. (.051 to .076 mm.) (from Engine No. 4045)

#### Valve rocker clearance

Running .. ..	.017 in. (.432 mm.)—hot
Timing .. ..	.021 in. (.53 mm.)
Timing markings ..	Dimples on timing wheels

#### Chain pitch and number of pitches

Chain pitch and number of pitches ..	$\frac{3}{8}$ in. (9.52 mm.), 52 pitches
--------------------------------------	--

#### Inlet valve

Opens .. ..	16° B.T.D.C.
Closes .. ..	56° A.B.D.C.

#### Exhaust valve

Opens .. ..	51° B.B.D.C.
Closes .. ..	21° A.T.D.C.

### Valve guides

#### Length

Inlet .. ..	1.875 in. (47.63 mm.) (Part No. 1G2882)
Exhaust .. ..	2.281 in. (57.94 mm.) (Part No. 1G2322 up to Engine No. 4044)
	2.203 in. (56.96 mm.) (Part No. 11G193 from Engine No. 4045)

#### Diameter

##### Inlet

Outside .. ..	.5635 to .5640 in. (14.3129 to 14.3256 mm.)	} Part No. 1G2882 up to Engine No. 23447
Inside .. ..	.3438 to .3443 in. (8.7354 to 8.7452 mm.)	
Outside .. ..	.5635 to .5640 in. (14.3129 to 14.3256 mm.)	} Part No. 11G313 from Engine No. 23448
Inside .. ..	.34425 to .34475 in. (8.74269 to 8.75665 mm.)	

##### Exhaust

Outside .. ..	.5635 to .5640 in. (14.3129 to 14.3256 mm.)	} Part No. 1G2322 up to Engine No. 4044
Inside .. ..	.3433 to .3438 in. (8.71982 to 8.7354 mm.)	
Outside .. ..	.5635 to .5640 in. (14.3129 to 14.3256 mm.)	} Part No. 11G193 from Engine No. 4045
Inside .. ..	.34425 to .34475 in. (8.74269 to 8.75665 mm.)	

#### Fitted height above head

head .. ..	.625 in. (15.87 mm.)
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### Valve springs

Free length		
Inner	.. ..	$1\frac{31}{32}$ in. (50 mm.)
Outer	.. ..	$2\frac{3}{64}$ in. (51.99 mm.)
Fitted length		
Inner	.. ..	$1\frac{7}{16}$ in. (36.51 mm.)
Outer	.. ..	$1\frac{9}{16}$ in. (39.69 mm.)
Number of working coils		
Inner	.. ..	$6\frac{1}{2}$
Outer	.. ..	$4\frac{1}{2}$
Pressure		
Valve open	..	Inner 50 lb. (22.7 kg.) Outer 105 lb. (47.6 kg.)
Valve closed	..	Inner 30 lb. (13.6 kg.) Outer $60\frac{1}{2}$ lb. (27 kg.)

### Tappets

Type	.. ..	Flat base. Barrel type
Diameter		
Body	.. ..	$\frac{13}{16}$ in. (20.64 mm.)
Working face	.. ..	$\frac{9}{16}$ in. (14.29 mm.)
Length	.. ..	2.293 to 2.303 in. (58.25 to 58.5 mm.)

### Rockers

Outside diameter before fitting	.. ..	.751 in. (19.07 mm.)
Inside diameter (reamed in position)	.. ..	.616 to .620 in. (15.65 to 15.74 mm.)
Bore of rocker arms	.. ..	.7485 to .7489 in. (19.01 to 19.02 mm.)
Rocker ratio	.. ..	1.426 : 1

### Camshaft

Journal diameters		
Front	.. ..	1.78875 to 1.78925 in. (45.43 to 45.44 mm.)
Centre	.. ..	1.72875 to 1.72925 in. (43.91 to 43.92 mm.)
Rear	.. ..	1.62275 to 1.62325 in. (41.22 to 41.23 mm.)
End-float	.. ..	.003 to .007 in. (.076 to .178 mm.)
Bearings—number and type	.. ..	3. Thinwall steel-backed white metal
Outside diameter (before fitting)		
Front	.. ..	1.920 in. (48.76 mm.)
Centre	.. ..	1.860 in. (47.24 mm.)
Rear	.. ..	1.754 in. (44.55 mm.)



### Camshaft—continued

Inside diameter (reamed in position)			
Front	..	..	1.790 in. (45.47 mm.)
Centre	..	..	1.730 in. (43.94 mm.)
Rear	..	..	1.624 in. (41.25 mm.)
Clearance	..	..	.001 to .002 in. (.0254 to .0508 mm.)

### Engine lubrication system

Oil pump			
Type	..	..	Eccentric rotor
Relief pressure			
valve operates	..	75 to 80 lb./sq. in. (5.3 to 5.6 kg./cm. <sup>2</sup> )	
Relief valve spring			
Free length	..	3 in. (76.2 mm.)	
Fitted length	..	2 $\frac{5}{8}$ in. (54.77 mm.) at 16 lb. (7.26 kg.) load	
Identification			
colour	..	..	Red spot
Oil filter			
Type	..	..	Tecalemit
Capacity	..	..	$\frac{1}{2}$ pint (.6 U.S. pints, .28 litre)
Oil pressure			
Normal running			
Minimum	..	30 lb./sq. in. (2.1 kg./cm. <sup>2</sup> )	
Maximum	..	80 lb./sq. in. (5.6 kg./cm. <sup>2</sup> )	

### Torque wrench settings

Cylinder head nuts	..	50 lb. ft. (6.91 kg. m.)
Main bearing nuts	..	70 lb. ft. (9.7 kg. m.)
Connecting rod set		
screws	..	35 lb. ft. (4.83 kg. m.)
Clutch assembly to		
flywheel	..	50 lb. ft. (6.91 kg. m.)

### Fuel system

Carburettor			
Make and type	..	S.U. twin H4 semi-down draught	
Diameter	..	1 $\frac{1}{2}$ in. (38.1 mm.)	
Needle	..	GS (Richer CC, Weaker No. 4)	
Jet	..	.090 in. (2.29 mm.)	
Carburettor piston	..	Part No. AUC8019	
Piston spring	..	Red (Part No. AUC4387)	

### Air cleaner

Make and type	..	Vokes, oil-wetted
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### Fuel pump

Make and type	..	S.U. electric, High-pressure
Delivery test	..	10 gals. per hr. (12 U.S. gals, 45.4 litres per hr.)
Suction lift	..	33 in. (83.8 cm.)
Output lift	..	48 in. (121.9 cm.)

### Cooling system

Type	..	Pressurized radiator, Thermo-siphon, pump and fan-assisted
Thermostat setting	..	70 to 72° C. (158° to 162° F.)
Quantity of anti-freeze		
15° frost	..	1 pint (1.2 U.S. pints, .57 litre)
25° frost	..	1½ pints (1.8 U.S. pints, .85 litre)
35° frost	..	2 pints (2.4 U.S. pints, 1.1 litres)

### Ignition system

Sparking plugs	..	Champion N5 (was previously called NA8)
Size	..	14 mm.
Plug gap	..	.019 to .021 in. (.48 to .53 mm.)
Coil	..	Lucas HA12
Distributor	..	Lucas, Type DM2. Later models DM2P4
Distributor contact points gap	..	.014 to .016 in. (.35 to .40 mm.)
Suppressors—type	..	Lucas No. 78106A fitted on each H.T. cable
Timing	..	7° B.T.D.C.

### Clutch

Make and type	..	Borg & Beck A6G. single dry plate
Diameter	..	8 in. (20.3 cm.)
Facing material	..	Wound yarn—Borglite
Damper springs	..	6
Colour	..	White with light-green stripes
Release lever ratio	..	9 : 1
Details of clutch pressure springs	..	6 springs × 165/175 lb. (75/79.4 kg.), black/yellow, Part No. 3H2914 to (E) 16225. After (E) 16225, 180/190 lb. (81.6/86 kg.), cream and green, Part No. 1H1024

### Gearbox

Number of forward speeds	..	4
Synchromesh	..	Second, third, and fourth gears



## Gearbox—continued

Ratios			
Top	..	..	1.0 : 1
Third	..	..	1.374 : 1
Second	..	..	2.214 : 1
First	..	..	3.64 : 1
Reverse	..	..	4.76 : 1
Overall ratios			
Top	..	..	4.3 : 1
Third	..	..	5.908 : 1
Second	..	..	9.520 : 1
First	..	..	15.652 : 1
Reverse	..	..	20.468 : 1

17.00 m.p.h. per 1,000  
 12.372 r.p.m.  
 7.678  
 4.670

Speedometer gears  
ratio .. .. 5/12

Optional axle ratios	Overall ratios	M.p.h. per 1,000 r.p.m.
Top .. ..	4.55 : 1	16.1
Third .. ..	6.25 : 1	11.7
Second .. ..	10.07 : 1	7.26
First .. ..	16.55 : 1	4.42
Reverse .. ..	21.61 : 1	3.38

Alternative axle ratios	Overall ratios	M.p.h. per 1,000 r.p.m.
Top .. ..	4.1 : 1	17.8
Third .. ..	5.63 : 1	13.0
Second .. ..	9.06 : 1	8.05
First .. ..	14.9 : 1	4.9
Reverse .. ..	19.5 : 1	3.74
Top .. ..	3.9 : 1	18.7
Third .. ..	5.36 : 1	13.7
Second .. ..	8.63 : 1	8.46
First .. ..	14.2 : 1	5.15
Reverse .. ..	18.6 : 1	3.94

## Steering

Type .. ..	Rack and pinion
Steering wheel turns —lock to lock ..	2 $\frac{2}{3}$
Steering wheel diameter .. ..	16 $\frac{1}{2}$ in.
Camber angle ..	1° positive to $\frac{1}{2}$ ° negative on full bump
Castor angle ..	4°
King pin inclination	9° to 10 $\frac{1}{2}$ ° on full bump
Toe-in .. ..	Wheels parallel





## Steering—continued

### Track

Front	.. ..	Disc wheels $47\frac{1}{2}$ in. (1.203 m.) Wire wheels $47\frac{7}{8}$ in. (1.216 m.)
Rear	.. ..	Disc wheels $48\frac{3}{4}$ in. (1.238 m.) Wire wheels $48\frac{3}{4}$ in. (1.238 m.)

## Front suspension

Type	.. ..	Independent coil	
Spring details		Up to Car No. 15151	From Car No. 15152
Coil diameter			
(mean)	.. ..	3.238 in. (82.24 mm.)	3.28 in. (82.25 mm.)
Diameter of wire	.. ..	.498 in. (12.66 mm.)	.54 in. (13.72 mm.)
Free height	.. ..	$9.28 \pm \frac{1}{16}$ in. (23.49 cm. $\pm$ 1.6 mm.)	$8.88 \pm \frac{1}{16}$ in. (22.55 cm. $\pm$ 1.6 mm.)
Number of free coils	7.5		7.2
Static laden length	.. ..	$6.65 \pm \frac{1}{32}$ in. (16.89 cm. $\pm$ .8 mm.)	
Static laden length			
load of	.. ..	905 lb. (410.27 kg.)	
Maximum deflection	.. ..	4 in. (10.16 cm.)	
Dampers (front)	.. ..	Piston type	

## Rear suspension

Type	.. ..	Semi-elliptic
Spring details		
Number of leaves	6	
Width of leaves	.. ..	$1\frac{3}{4}$ in. (44.45 mm.)
Gauge	.. ..	$\frac{7}{32}$ in. (5.56 mm.)
Working load	.. ..	450 lb. (203.7 kg.)
Free camber	.. ..	3.60 in. (91.44 mm.)
Dampers (rear)	.. ..	Piston type

## Propeller shaft

Type	.. ..	Tubular, reverse spline
Make and type of joints	.. ..	Hardy Spicer, needle roller
Propeller shaft length (between centres of joints)	.. ..	$31\frac{3}{8}$ in. (79.69 cm.)
Overall length	.. ..	$38\frac{1}{2}$ in. (97.44 cm.)
Diameter	.. ..	2 in. (50.8 mm.)



### Rear axle

Make and type	..	B.M.C. 'B' type, three-quarter-floating
Ratio		
Standard ..	..	10/43
Optional ..	..	9/41
Adjustment	..	Shims

### Electrical Equipment

System	..	12-volt, positive earth
Charging system	..	Compensated voltage control
Battery	..	Two 6-volt Lucas SG9E
Starter motor	..	Lucas 4-brush M35G
Dynamo	..	Lucas C39PV2

### Brakes

Type	..	Lockheed hydraulic (front and rear)
Size	..	10 in. by $1\frac{3}{4}$ in. (25.4 cm. by 44.45 mm.)
Front	..	Two leading shoes
Rear	..	Single leading shoe
Drum size	..	10 in. (25.4 cm.) (front and rear)
Lining dimensions	..	9.6 in. by $1\frac{3}{4}$ in. (24.38 cm. by 44.45 mm.)
Lining area		
Front	..	67.2 sq. in. (433.55 cm. <sup>2</sup> )
Rear	..	67.2 sq. in. (433.55 cm. <sup>2</sup> )
Material	..	Ferodo DM12

### Wheels

Type		
Ventilated disc	..	4J x 15
Wire (optional)	..	4J x 15 and 48-spoke

### Tyres

Size	..	5.60—15
Tyre pressures		
Normal		
Front	..	17 lb./sq. in. (1.2 kg./cm. <sup>2</sup> )
Rear	..	20 lb./sq. in. (1.4 kg./cm. <sup>2</sup> )
Fast motoring		
Front	..	21 lb./sq. in. (1.48 kg./cm. <sup>2</sup> )
Rear	..	24 lb./sq. in. (1.69 kg./cm. <sup>2</sup> )
Competition work and sustained high-speed motoring		
Front	..	23 lb./sq. in. (1.62 kg./cm. <sup>2</sup> )
Rear	..	26 lb./sq. in. (1.83 kg./cm. <sup>2</sup> )





### Capacities

	<i>Imp.</i>	<i>U.S.</i>	<i>Litres</i>
Engine sump (incl. filter) ..	7 pts.	8½ pts.	4.00
Gearbox ..	4 pts.	5 pts.	2.27
Rear axle ..	2¾ pts.	3¼ pts.	1.56
Cooling system ..	10 pts.	12 pts.	5.67
Steering rack ..	½ pt.	·6 pt.	·28
Fuel tank ..	10 gals.	12 gals.	45.4
Brake system ..	1 pt.	1.2 pts.	·568

### General Dimensions

Wheelbase ..	94 in. (238.8 cm.)
Overall length ..	156 in. (396.2 cm.)
Overall width ..	58 in. (147.3 cm.)
Overall height ..	50 in. (127.0 cm.)
Ground clearance ..	6 in. (15.24 cm.)
Weight: fully equipped with tools, spare wheel, oil, water, and 2 gals. of fuel (2.5 U.S. 9.1 litres) ..	1,988 lb. (901.81 kg.)
Turning circles ..	28 ft. (8.534 m.)



## Stage MGA.1

### Tuning by port polishing

An increase of some three b.h.p. can be had by general attention to the cylinder head and port polishing as detailed below:

Lightly grind and polish the exhaust and inlet ports throughout. They should not be ground out so heavily that the shape or valve choke diameters are impaired.

Match up, by grinding, all the exhaust and inlet manifold ports with the cylinder head ports.

Grind out and polish the inlet manifold, also matching the carburettor bore. Make the bore of the manifold a gradual taper from the carburettor end to the cylinder head port, grinding away any ridges left by machining during manufacture.

Do not grind out the combustion spaces as these are already quite clean and partly machined, but remove any frazes and lightly polish all over. Any enlargement around the combustion walls may cause the cylinder head gasket to overlap and destroy the efficiency of the seal. Also the compression ratio will be lowered and the tuning will be ineffective.

On engines prior to 17151 it is necessary to grind out and enlarge the inlet port at the neck (see Fig. 1). Make up a sheet-metal template to the dimensions given in Fig. 1 and fasten it to a long bolt so that it may be used as a gauge when grinding out the inlet ports.

On engines prior to 4046 bore out the exhaust port valve throat to the dimensions given in Fig. 1, at the same time reducing the length of the exhaust valve guide and boss by  $\frac{3}{32}$  in. at the port end (see Fig. 2).

All engines after Engine No. 4045 have the increased diameter exhaust throat and the shortened guide. All engines from Engine No. 17151 have the enlarged inlet port neck.

The illustration in Fig. 3 on page 20 shows the peak of the combustion chamber ground away to a  $\frac{3}{8}$  in. radius. This need only be done if the cast point is rather thin and sharp; if the casting is stubby and round-ended it may be left alone.

The engine should then give approximately 75 brake-horse-power at 5,750 r.p.m.

It is sometimes found beneficial, but not essential, to fit the richer carburettor needles 'CC'.

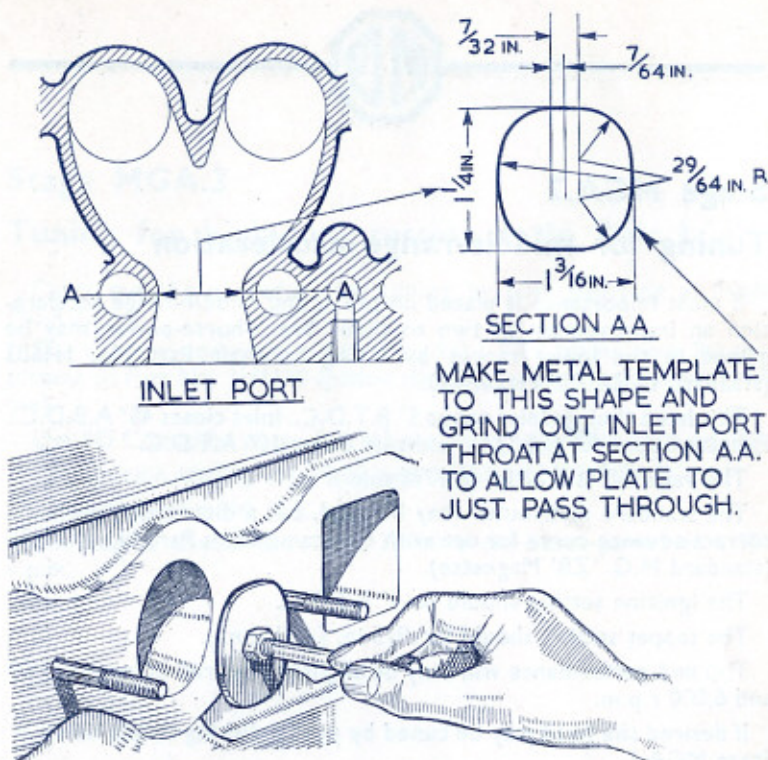


Fig. 1

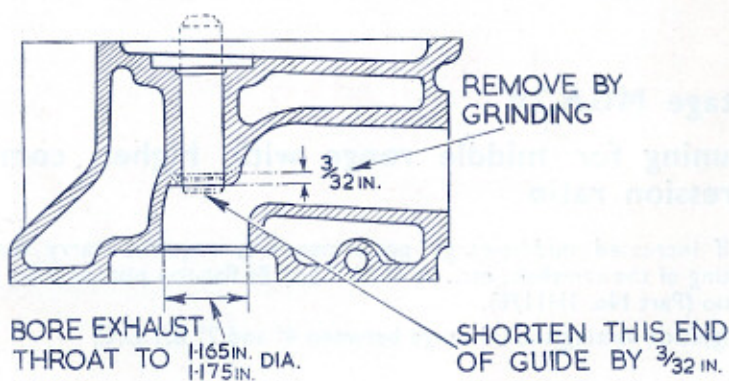


Fig. 2





## **Stage MGA.2**

### **Tuning for middle-range acceleration**

If most importance is placed on initial and middle-range acceleration an improvement of two to three brake-horse-power may be gained in the lower ranges by fitting camshaft Part No. 1H603 (standard M.G. 'ZB' Magnette).

This has a timing: Inlet opens  $5^{\circ}$  B.T.D.C., inlet closes  $45^{\circ}$  A.B.D.C., Exhaust opens  $40^{\circ}$  B.B.D.C., exhaust closes  $10^{\circ}$  A.T.D.C.

The valve lift is  $\cdot 322$  in. (8.1778 mm.).

The standard distributor may be used, but a distributor with the correct advance curve for use with this camshaft is Part No. 1H1036 (standard M.G. 'ZB' Magnette).

The ignition setting should be  $4^{\circ}$  B.T.D.C.

The tappet setting should be  $\cdot 015$  in. ( $\cdot 381$  mm.).

Top end performance will only be slightly impaired between 5,000 and 6,000 r.p.m.

If desired the head may be tuned by port polishing as laid down in Stage MGA.1.

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## **Stage MGA.2A**

### **Tuning for middle range with higher compression ratio**

If increased middle-range performance is required carry out fitting of the camshaft, etc., as MGA.2 and fit flat-top pistons 9.0 : 1 ratio (Part No. 1H1178).

Ignition setting should range between  $4^{\circ}$  and  $2^{\circ}$  B.T.D.C.



## Stage MGA.3

### Tuning for high-compression ratio 9.0 : 1

Carry out the procedure for tuning by port polishing as Stage MGA.1.

The compression ratio is raised to 9.0 : 1 by fitting new flat-top pistons to Part No. 1H1178 (piston complete with rings and gudgeon pin).

Use N5 Champion plugs, but N3 may be required for hard driving.

The ignition setting should be approximately 4° B.T.D.C.

Carburettor needles 'CC'.

The engine should then give 78-80 brake-horse-power at 6,000 r.p.m.



## Stage MGA.4

### Tuning for high-compression ratio 10:1 : 1

Carry out the procedure for port polishing as Stage MGA.1.

The compression ratio is raised to 10:1 : 1 by fitting special raised-top pistons to Part No. 1H1108 (complete with rings and gudgeon pins).

The raised portion on the piston head is shaped to match the combustion space, and the piston will only fit one way round—that is, with the sloping face of the raised head towards the sparking plug side.

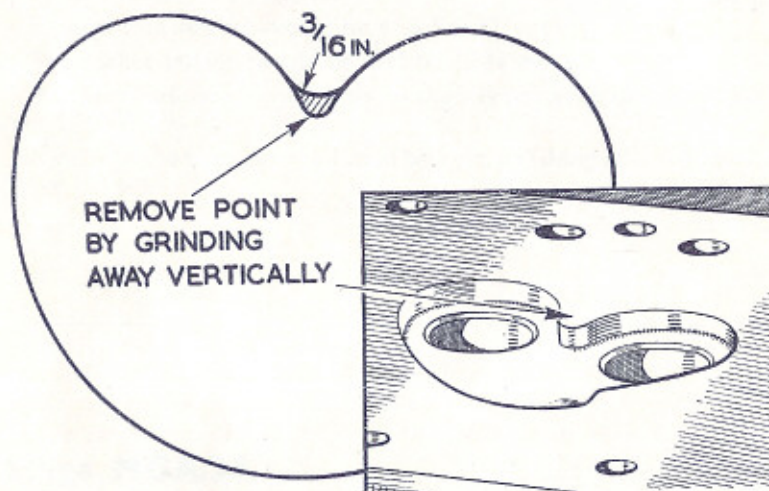


Fig. 3

Also grind away the point on each combustion space as in Fig. 3, otherwise this will foul the raised portion of the piston head. Check the clearance at this point by putting a small blob of plasticine locally on the piston head, when at the top of the stroke, and drop the cylinder head over the studs. Examine the impression and ensure a lateral clearance of  $\frac{1}{16}$  in. from the raised head of the piston. These pistons are for special competition purposes; they have increased clearances over the standard pistons and may give some increase of oil consumption.





The special pistons have fully floating gudgeon pins of diameter increased to  $\frac{7}{8}$  in. (22.22 mm.), and will require new connecting rods:

2 off Part No. AEH431 } Use in balanced sets.  
2 off Part No. AEH433 }

With the above high-compression ratio it is essential that the cylinder head gasket be clamped efficiently. Check the cylinder head face, and if not dead flat have the face lightly and accurately surface-ground or fine-machined.

Use super premium 100-octane gasoline.

N5 Champion plugs for normal driving, but N3 required for hard driving.

Ignition setting  $2^{\circ}$  B.T.D.C.

Carburetter needles 'CC'.

The engine then gives 86 brake-horse-power at 6,000 r.p.m.

## Stage MGA.4A

### Tuning with high-compression ratio 10.1:1 and larger carburetters

Tune the engine as the procedure for Stage MGA.4.

Fit  $1\frac{3}{4}$  in. (44.45 mm.) dia. S.U. carburetters (Part No. AUC780); these are fitted with .100 jets and KW needles. Alternative needles—richer RF, weaker KW1.

A new inlet manifold (Part No. AEH200) will be required. This manifold has a  $\frac{5}{8}$  in. (15.87 mm.) dia. by-pass hole in the balance pipe.

Polish this manifold as explained in Stage MGA.1.

To prevent vibration of the carburetters it is advisable to use a synthetic rubber gasket (Part No. AHH5791) between the carburetters and the manifold and a  $\frac{1}{8}$  in. (3.18 mm.) thick double-coil spring washer under the carburetter fixing nuts, so that the carburetters may be left not quite tightened solid. Wire the nuts in pairs to prevent them becoming slack.

No air cleaners are arranged for these carburetters, but the standard ones would be suitable if bored out to  $1\frac{1}{4}$  in. (46.04 mm.) dia. and fixing nuts and vent holes altered to match the  $1\frac{3}{4}$  in. (44.45 mm.) carburetter flange. These carburetters will not give a large improvement, but the engine should give about 88 brake-horse-power at 6,000 r.p.m.



## Other Special Items

### Valves

If an exhaust valve is desired with a longer service life or more resistant to burning, valves (Part No. 1H1025) which have a Bright Ray hard face are available.

### Brakes

After many consecutive applications of the brakes during competition driving some brake fade may be experienced with the standard linings.

Competition linings or lined shoes are available (see list).

With fair competition driving these linings will be free from fade, but will give a harder pedal effort on application.

Brake-drum life will be decreased.

### Balancing of road wheel and tyre assemblies

To obtain the smoothest steering, free from all steering wheel kick, and to eliminate any tendency to front wheel patter, especially at speeds around 70 m.p.h. (113 km.p.h.) and over, it will be found beneficial to have the front road wheel and tyre assemblies statically and dynamically balanced. This usually results in balance weights being fitted on both sides of the rims, but this dynamic balancing is well worth while. Balance may require re-checking every few thousand miles if the car suffers brake locking, etc., as this may again put the tyres out of balance enough for the effect to be felt.

It is advisable to keep front tyres in good condition and free from uneven tread wear. This can sometimes be done by changing tyres from front to rear before uneven wear develops.

Pick the best tyres for use at the front (or those that have even tread wear and run true) before they are dynamically balanced.

Balancing a tyre which has flats or uneven wear is not usually very successful. In some cases the tread can be buffed true, but this is not an economic way of using rubber.

### Clutch

Up to Engine No. 16225 the clutches were fitted with pressure springs (Part No. 3H2914), black and yellow markings, 165/175 lb.





(75/79.4 kg.) load. Some delay in clutch take-up may be experienced when making very fast up gear changes. If a quicker take-up is desired clutch pressure springs (Part No. IH1024), cream and green marking, 180/190 lb. (81.6/86 kg.) load, can be fitted.

All engines after 16225 are fitted with the 180/190 lb. (81.6/86 kg.) springs, and these clutches should be capable of handling most competition work, but if a high-duty clutch is required, then a competition clutch assembly (Part No. AHH5457) is available. This may be expected to give a somewhat sharp take-up but will stand any amount of hard work.

### Sparking plugs and suitable alternatives

<i>Champion</i>		<i>Lodge</i>		<i>K.L.G.</i>
N5	=	HLN	=	FE70
N3	=	3 HLN	=	FE100

**Note.**—The previous designations of Champion plugs were NA8 for N5 and NA10 for N3.

Some arduous conditions may call for sparking plugs in the racing range, such as Champion N58R (was NA12), Lodge RL47, or K.L.G. FE220.

It is advisable to refer to the plug representatives for advice on the full range available.

### Valve springs

The valve bounce r.p.m. on the standard engine is 6,000 r.p.m., and the valve springs, operating mechanism, and drive are safely stressed to maintain this.

If for very special competition purposes it is desired to raise the valve bounce period to 6,300/6,400 r.p.m., then outer springs (Part No. IH1111) and inner valve springs (Part No. IH1112) are available.

It is advised that these springs be used only for very special events, as if used under everyday conditions the cams and followers will have a shorter service life.

The springs will not necessarily give an increase in brake-horsepower, but will extend the same horse-power up to valve bounce.

This is sometimes useful in enabling a lower gear to be retained, still maintaining the same maximum speed, with increased power for acceleration.

### Close-ratio gearbox

Close-ratio gears are available giving gearbox ratios of—third 1.268 : 1, second 1.62 : 1, first 2.45 : 1.





The following parts are required to rebuild your standard box to these ratios:

IH3297	First motion shaft	..	..	1 off
IH3298	Laygear	..	..	1 off
IH3299	Second speed mainshaft gear			1 off
IH3300	Third speed mainshaft gear			1 off

### Rear axle ratios

With the combination of the 4.55, 4.3, 4.1, and 3.9 : 1 axle ratios available and the standard and close-ratio gears for the gearbox it should be possible to obtain a combination of conditions suitable for most competition purposes

### Oil cooler

An aluminium alloy oil cooler is available. This is supplied complete with high-duty flexible hoses and can easily be mounted on the floor behind the radiator grille as depicted in Fig. 4.

### Water thermostat

For sustained maximum power and speed, such as in road-racing conditions, it is advantageous to remove the thermostat. This will ensure the maximum water flow at all times the engine is on full output.

### Fuel pump

Check the fuel flow of your petrol pump by removing the two float-chamber tops complete with the fuel lines. Unclip the main fuel line and reassemble it alongside the car so that the two float-chamber tops (complete with needles and levers) can be held over a 2 gal. (2.4 U.S. gals., 9.1 litres) or larger can.

Switch on the pump and check the time for 1 gal. (9.6 U.S. pints, 4.5 litres) to flow.

The standard engine uses a maximum of approx. 5.7 gals. (6.8 U.S. gals., 26.5 litres) an hour, and the engine tuned to Stage 4A uses approx. 7 gals. (8.4 U.S. gals., 32 litres) an hour.

A good pump may flow at 9 gals. (10.8 U.S. gals., 41 litres) an hour, but a pump needing attention may only flow 6 gals. (7.2 U.S. gals., 27.3 litres) an hour.

If a pump is required which will give a flow with a wide safety margin S.U. fuel pump, (Part No. AUA73) is available.

The mounting bracket will need slight alteration to mount this pump and the fuel lines reset to suit.

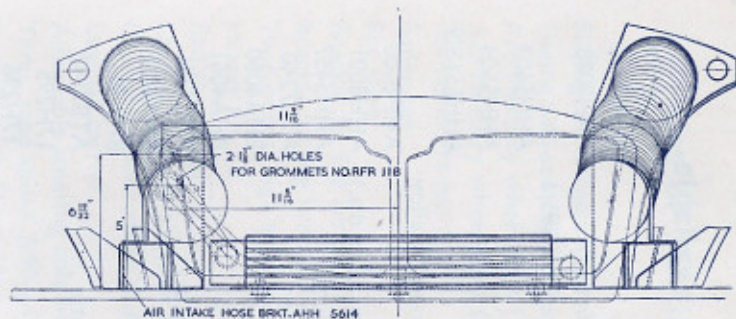
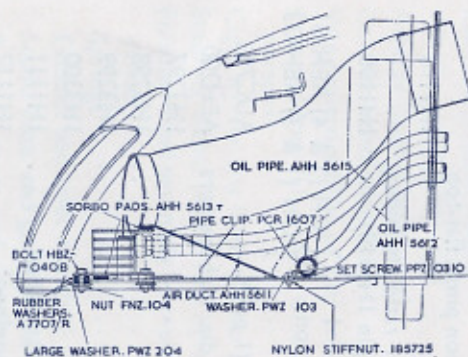
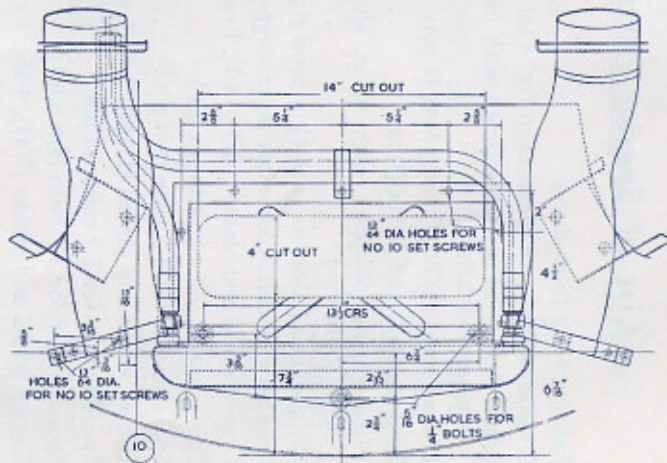


Fig. 4

The general arrangement of the oil cooler, together with dimensions to assist installation







## List of Special Parts available

	Part No.
Exhaust valve (high-duty) .. .. .	IHI025
Oil cooler (kit) (see illustration Fig. 4 for fitting) ..	ARH0088
Brake-shoe lined assembly (lined with Ferodo VG95/1 competition facings) .. .. .	AHH5603
Brake linings (VG95/1) and rivets (1 set) .. ..	AHH5604
Bonnet straps and plates (1 pair) .. .. .	AHH5518/9
Wire wheels (60-spoke with $4\frac{1}{2}$ in. aluminium alloy rims, 15 in. dia.) .. .. .	AHH8000
Wire wheels (60-spoke with $4\frac{1}{2}$ in. steel rims, 15 in. dia.)	AHH8001
Competition clutch assembly (extra-high-duty) ..	AHH5457
Crown wheel and pinion (10/41), 4.1 : 1 ratio .. ..	ATB7240
Speedometer for 4.1 ratio (m.p.h.) .. .. .	BHA4060
Speedometer for 4.1 ratio (km.p.h.) .. .. .	BHA4061
Crown wheel and pinion (11/43), 3.9 : 1 ratio .. ..	ATB7236
Speedometer for 3.9 ratio (m.p.h.) .. .. .	BHA4068
Speedometer for 3.9 ratio (km.p.h.) .. .. .	BHA4069
Crown wheel and pinion (9/41), 4.55 : 1 ratio .. ..	ATB7146
Speedometer for 4.55 ratio (m.p.h.) .. .. .	I7H295
Speedometer for 4.55 ratio (km.p.h.) .. .. .	I7H296
Piston (complete with rings and gudgeon pins), flat-top, 9.0 : 1 ratio .. .. .	IHI178
Piston complete, raised head, 10.1 : 1 ratio (including rings, piston IHI109, and gudgeon pin IHI110) ..	IHI108
Connecting rods (for use with 10.1 : 1 pistons having fully floating gudgeon pins) .. .. .	<div> R/H (2 &amp; 4) AEH431  L/H (1 &amp; 3) AEH433 </div>
Carburettors $1\frac{3}{4}$ in. (44.45 mm.) dia. (1 pair) .. ..	AUC780
Inlet manifold for $1\frac{3}{4}$ in. (44.45 mm.) dia. carburetters	AEH200
First motion shaft .. .. .	IH3297
Laygear .. .. .	IH3298
Second speed mainshaft gear .. .. .	IH3299
Third speed mainshaft gear .. .. .	IH3300
Valve springs—outer } See Special Note under .. ..	IHI111
Valve springs—inner } <b>'Valve springs'</b> .. ..	IHI112
Synthetic rubber gasket ( $1\frac{3}{4}$ in. [44.45 mm.] carburetters)	AHH5791
Fuel Pump .. .. .	AUA73





## List of Special Accessories available

	Part No.
Sliding side-screens (R/H) .. .. .	AHH5731
Sliding side-screens (L/H) .. .. .	AHH5732
Ace Mercury wheel discs (R/H) } set .. .. .	97H676
Ace Mercury wheel discs (L/H) } 4 .. .. .	97H675
Rimbellishers (set 5) .. .. .	AHH8002
Badge bar .. .. .	AHH5565
Fog lamp .. .. .	ADH785
Bracket for fog lamp (R/H) .. .. .	AHH5521
Bracket for fog lamp (L/H) .. .. .	AHH5520
Twin horns (high note) .. .. .	ACC5238
Heater kit .. .. .	AHH5422
Radiator blind .. .. .	AHH5536
Overall tonneau cover (R.H.D.) .. .. .	AFH2626
Overall tonneau cover (L.H.D.) .. .. .	AFH2628
Luggage carrier .. .. .	AHH5495
Adjustable steering column .. .. .	AHH6012
Tyres, road speed, 5-90—15 .. .. .	AHH5523
Radio (kit) Radiomobile .. .. .	—
Windscreen washer (kit) .. .. .	AHH5683
Ashtray (tunnel mounting) .. .. .	AHH5539
Cold air ventilation (kit) .. .. .	AHH5532
Wing mirrors (R/H or L/H wing) .. .. .	BHA4066
Competition full-width windscreen (aluminium and perspex) .. .. .	AFH2591
Cigar lighter c/w leads (Casco Tex) .. .. .	AHH5759
Steering wheel (wood rim, light alloy, Italian style) .. .. .	AHH5800
Polished head assembly complete with .. .. .	IHI159
Valves	
Springs	
Exhaust and inlet manifold	
Studs, nuts, and gaskets fitted	
Polished ports and matched manifolds by Laystall Eng. Co. Ltd. and supplied as a complete unit.	

## NOTES

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