M.G. Technical Literature.

SPECIAL TUNING.

Issued by
M.G. CAR COMPANY LIMITED.
Proprietors: Morris Motors Ltd.
ABINGDON - ON - THAMES.

SOLE EXPORTERS:
NUFFIELD EXPORTS LIMITED.
Proprietors: Morris Motors Ltd.
COWLEY - OXFORD - ENGLAND.

M.G.A.

Cream Cover.
Brown lettering.
Cream sheets.
Brown top edges.
This is another of the "M.G. Tuning Booklets" which have been issued in recent years. It deals specifically with the Series 'M.G.A.'.

The M.G.A., 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 car. We hope this section will be of use to them.
ENGINE.

Type
Number of cylinders
Bore
Stroke
Capacity
Firing order
Compression ratio:
Capacity of Combustion Chamber (valves fitted)
Valve operation
Safe Maximum R.p.m. :
Valve Crash R.p.m. :
B.H.P. :
B.M.E.P. :
Torque : (Foot lbs.)
Octane Rating :
Cooling system
Oversize Bore : 1st
Max.

R.P.M. 15 G.B. or 15, G.B. / U.H.

2.875 in. (73.025 m.m.)
3.5 in. (89 m.m.)
90.88 cu. in. (1489 c.c.)
1, 3, 4, 2
8.3 to 1
38.2 to 39.2 c.c. (2.3 to 2.4 cu. in.)

Overhead by push-rod.
5,800
6,000
72 at 5,750 r.p.m.
133 at 3,850 r.p.m.
80.2 at 3,850 r.p.m.

Minimum requirements for knock - free operation. 87 - 90 Octane.

Thermo-syphon, pump and fan assisted.

Octane Rating :

.010 in. (.254 m.m.)
.040 in. (1.016 m.m.)

CRANKSHAFT.

Main journal diameter
Minimum regrind diameter
Crankpin Journal diameter
Crankpin minimum regrind diameter.

2 in. (50.8 m.m.)
1.96 in. (49.78 m.m.)
1.8759 to 1.8764 in. (47.65 to 47.66 m.m.)
1.8359 in. (46.64 m.m.)

MAIN BEARINGS.

Number and type
Material bottom half
Material top half
Length
End clearance
End thrust
Running clearance

Three. Shell-type.
Steel Backed. White metal.
Steel Backed. White metal.
1.375 in. (34.925 m.m.)
.002 to .003 in. (.051 to .076 m.m.)
Taken by thrust washers at centre main bearing.

.0005 to .002 in. (.0127 to .0508 m.m.)

CONNECTING RODS.

Length between centres
Big-end bearings
Material top half.
Material bottom half.
Bearing side clearance
Bearing diametrical clearance

6.5 in. (165.1 m.m.)
Steel Shell & Lead Indium. )Pt. No.
Steel Shell & Lead Indium. /1.H. 717
marked 'V.P.'

.008 to .012 in. (.203 to .305 m.m.)
.0001 to .0016 in. (.002 to .04 m.m.)

(Cont'd)
PISTONS

Type
Clearances:
   Bottom of skirt
   Top of skirt
Oversizes

PISTON RINGS.

Compression: Plain
   Tapered
   Width
   Thickness
   Fitted gap
   Clearance in groove
Oil-control ring:
   Width
   Thickness
   Fitted gap
   Clearance in groove

Aluminium alloy.

0.017 to 0.023 in. (0.43 to 0.51 mm)
0.035 to 0.042 in. (0.90 to 1.06 mm)
+ 0.040 in. + 0.020 in. + 0.030 in. + 0.040 in.
(+2.54 mm), (+5.08 mm), (+7.62 mm),
(+1.06 mm)

Top rings (Chrome plated)
   2nd. and 3rd. rings
   0.111 to 0.118 in. (2.81 to 3.00 mm)
   0.0615 to 0.0625 in. (1.56 to 1.58 mm)
   0.008 to 0.013 in. (0.20 to 0.33 mm)
   0.015 to 0.035 in. (0.38 to 0.89 mm)
   Slotted scraper.
   0.1552 to 0.1562 in. (3.94 to 3.99 mm)
   0.111 to 0.118 in. (2.81 to 3.00 mm)
   0.008 to 0.013 in. (0.20 to 0.33 mm)
   0.0016 to 0.0036 in. (0.040 to 0.091 mm)

Clamped
   0.0004 to 0.00035 in. (0.0025 to 0.009 mm)
   Hand push fit to 68 ft.

6869 to 6871 in. (17,447 to 17,4523 mm)

GUDGEON PIN.

Type
   Fit
   Diameter

CYLINDER HEAD.

Cylinder Head Depth
   Thickness of Cylinder Head Gasket.
   Thickness of Cylinder Head Gasket.
C.C. of Cylinder Head Gasket
C.C. of Combustion Space
C.C. of Piston Head below block face.
C.C. of Piston concavity
C.C. of plug centre hole
Inlet and Exhaust Manifold Gasket
Valve seat angle in cylinder head.

3.11/64" + 1/64" = 0".
0.035" (compressed)
(Pt. No. 1.H.696 up to Engine No. 15687).
0.029" (compressed)
(Pt. No. 1.H.1017 after Engine No. 15688).
3.73 c.c.
38.2/33.2 c.c. (valves fitted).
3.5 c.c.
4.85 c.c.
2 c.c.
45°

(Cont'd).....................

- 3 -
## VALVES AND VALVE GEAR

<table>
<thead>
<tr>
<th>Valves</th>
<th>Seat Angle</th>
<th>Inlet</th>
<th>Inlet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exhaust</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Head diameter</th>
<th>Inlet</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stem diameter</th>
<th>Inlet</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Valve Lift**

- Exhaust valve throat diameter:
- Inlet valve throat diameter
- Valve stem to guide clearance:
  - Inlet

**Valve stem to guide clearance**

- Exhaust
- Exhaust

**Valve rocker clearance:**
- Running
- Timing

**Timing markings**

**Chain pitch and number of pitches**

<table>
<thead>
<tr>
<th>Inlet valve</th>
<th>Opens</th>
<th>Closes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Exhaust valve</th>
<th>Opens</th>
<th>Closes</th>
</tr>
</thead>
</table>

| 45° | To Engine No. 4044 |
| 45° | From Engine No. 4045 |
| 45° | From Engine No. 4045 |

- 1.5" (38.1 m.m.)
- 1.281" (8.73 m.m.)
- 34175" (8.74047 m.m.)
- 34225" (8.69189 m.m.)
- 23447" (Pt. No. 1.H. 653 Ceased Engine No. 23447)
- 3422" (8.69188 m.m.)
- 3427" (8.70458 m.m.)
- 34175" (8.74047 m.m.)
- 34225" (8.69189 m.m.)
- 357" (9.06 m.m.)
- 1.165"
- 1.175"
- 1.25"
- 0.00155"
- 0.00255"
- 0.00105" To Engine No. 4044
- 0.00205"
- 0.00200" From Engine No. 4045
- 0.03000" (Hot)
- 0.017" (0.432 m.m.)
- 0.021" (0.53 m.m.)

- Dimples on timing wheels
- 3/8" (9.52 m.m.) 52 Pitches
- 16° B.T.D.C.
- 56° A.B.D.C.
- 51° B.B.D.C.
- 21° A.T.D.C.

(Cont'd).............
### GENERAL DATA (Continued).

#### VALVE GUIDES.

<table>
<thead>
<tr>
<th>Length</th>
<th>Inlet</th>
<th>1.875&quot; (47.63 mm)</th>
<th>Pt. No. 1G. 2882</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust</td>
<td>2.281&quot; (57.94 mm)</td>
<td>Pt. No. 1G. 2322, to Engine No. 4044.</td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>2.203&quot; (56.96 mm)</td>
<td>Pt. No. 1G. 193, From Engine No. 4045.</td>
<td></td>
</tr>
<tr>
<td>Diameter:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet Outside</td>
<td>0.5635&quot; (14.3129 mm)</td>
<td>Pt. No. 1G. 2882, Ceased Engine No.</td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>0.5640&quot; (14.3256 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside</td>
<td>0.3438&quot; (8.7354 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.3443&quot; (8.7452 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>0.5635&quot; (14.3129 mm)</td>
<td>Pt. No. 1G. 313, Commence Engine No. 23448</td>
<td></td>
</tr>
<tr>
<td>Inside</td>
<td>0.34425&quot; (8.74269 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.34475&quot; (8.75665 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>0.5635&quot; (14.3129 mm)</td>
<td>Pt. No. 1G. 2322, Ceased Engine No. 4044.</td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>0.5640&quot; (14.3256 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside</td>
<td>0.3433&quot; (8.71982 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.3438&quot; (8.7354 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside</td>
<td>0.5635&quot; (14.3129 mm)</td>
<td>Pt. No. 1G. 193, Commence Engine No. 4045.</td>
<td></td>
</tr>
<tr>
<td>Inside</td>
<td>0.34425&quot; (8.74269 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.34475&quot; (8.75665 mm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fitted height above head: 625" (15.87 mm)

#### VALVE SPRINGS.

<table>
<thead>
<tr>
<th>Free Length</th>
<th>Inner: 1.31/32 in. (50 mm)</th>
<th>Outer: 2.3/64 in. (51.99 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitted Length</td>
<td>Inner: 1.7/16 in. (36.51 mm)</td>
<td>Outer: 1.9/16 in. (39.69 mm)</td>
</tr>
<tr>
<td>Number of working Coils: Inner: 61/2, Outer: 41/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure: Valve open: Inner: 50 lb. (22.7 kg), Outer: 105 lb. (47.6 kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve closed:</td>
<td>Inner: 30 lb. (13.6 kg)</td>
<td>Outer: 60.1/2 lb. (27 kg)</td>
</tr>
</tbody>
</table>

- 4s &-
TAPPETS.

Type: Flat base, Barrel Type.
Diameter: 13/16 in. (20.64 mm)
Body: 9/16 in. (14.29 mm)
Working face: 2.293 to 2.303 in. (58.25 to 58.5 mm)
Length:

ROCKERS.

Outside diameter before fitting: 0.751 in. (19.07 mm)
Inside diameter (reamed in position): 0.616 to 0.620 in. (15.65 to 15.74 mm)
Bore of rocker-arms: 0.7485 to 0.7489 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)
Bearing: number and type: Three, Thimwall 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))

Inside diameter (reamed in position): (Front 1.790 in. (45.47 mm))
(Centre 1.730 in. (44.04 mm))
(Rear 1.624 in. (41.25 mm))
Clearance: .001 to .002 in. (.025 to .0508 mm)

ENGINE LUBRICATION SYSTEM.

Oil pump: Eccentric rotor.
Type: Relief pressure valve operates 75 to 80 lb/sq. in. (5.3 to 5.6 kg/cm²).
Relief valve spring: Free length: 3 in. (76.2 mm)
Pitted length: 2.5/32 in. (54.77 mm) at 16 lb. (7.26 kg) load.
Identification colour: Red spot.

Oil filter:
Type: Tecalemit
Capacity: 1/2 pint (.28 litre)

Oil pressure:
Minimum: 30 lb/sq.in. (2.1 kg/cm²)
Maximum: 80 lb/sq.in. (5.6 kg/cm²)
GENERAL DATA (Continued)

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
Diameter 1.1/2 in. (38.1 mm.)
Needle G.S (Richer C.C., Weaker No.4)
Jet .090 in. (2.29 mm.)

AIR CLEANER

Make and type Vokes - oil-wetted.

FUEL PUMP.

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

COOLING SYSTEM

Type Pressurised radiator. Thermo-syphon,
Thermostat setting. pump and fan assisted.
70° - 72° C. (158° - 162° F.)
Quantity of anti-freeze
150° frost 1 pint (.57 litre)
250° frost 1.1/2 pints (.85 litre)
350° frost 2 pints (1.1 litres)

IGNITION SYSTEM.

Sparking plugs Champion N.5. (was previously called
Size 14 mm.)
Plug gap .019 to .021 in. (.48 to .53 mm.)
Coil Lucas H.A.12.
Distributor Lucas Type D,M,2 Later models D,M,2. P.4,
Distributor contact points gap .014 to .016 in. (.35 to .40 mm.)
Suppressors type Lucas No. 78106.A. fitted on each H.T.
Timing. 7° B.T.D.C.

- 6 - (Cont'd) ..............
CLUTCH.

Make and type
Diameter
8 in. (20.3 cm.)
Facing material
Wound yarn - "Borglite".
Damper springs
6.
Colour
White with light Green strips.
Release lever ratio
9 : 1.
Details of Clutch Pressure Springs:
6 springs x 165/175 lb. Black/Yellow.
Pt. No. 3H.2914 up to Eng. No. 16225.
After Engine No. 16225, 180/190 lbs.
Cream & Green. Pt. No. 1H.1024.

GEARBOX.

No. of forward speeds 4.
Synchromesh.
Ratios: Top
2nd, 3rd, and 4th. gears.
1.0 : 1.
3rd.
1.374 : 1.
2nd.
2.214 : 1.
1st.
3.64 : 1.
Reverse.
4.76 : 1.
Overall ratios: Top
3rd.
4.3 : 1.
2nd.
5.908 : 1.
1st.
9.520 : 1.
Reverse
15.652 : 1.
Overall ratios: 1st
20.468 : 1.
Speedometer gears ratio
5 : 12.
Optional Axle ratio:
Top
4.55 : 1
3rd.
6.25 : 1
2nd.
10.07 : 1
1st.
16.55 : 1
Reverse
21.61 : 1
Alternative Axle Ratio:
Top
4.1 : 1
3rd.
5.63 : 1
2nd.
9.06 : 1
1st.
14.9 : 1
Reverse
19.5 : 1
Top
3rd.
3.9 : 1.
2nd.
5.36 : 1.
1st.
8.63 : 1.
Reverse
14.2 : 1.

M.P.H. per 1000 RPM.
16.1
11.7
7.26
4.42
3.38
17.8
13
8.05
4.9
3.74
18.7
13.7
8.46
5.15
3.94

(Cont'd).............
**GENERAL DATA (Continued).**

**STEERING.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Rack and Pinion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering wheel turns -</td>
<td>2.2/3</td>
</tr>
<tr>
<td>Lock to lock.</td>
<td></td>
</tr>
<tr>
<td>Steering wheel diameter</td>
<td>16.1/2 in.</td>
</tr>
<tr>
<td>Camber angle</td>
<td>10° positive to 1/2° negative on full bump.</td>
</tr>
<tr>
<td>Castor angle</td>
<td>4°</td>
</tr>
<tr>
<td>King-pin inclination</td>
<td>9° to 10.1/2° on full bump</td>
</tr>
<tr>
<td>Toe-in</td>
<td>Wheels parallel.</td>
</tr>
</tbody>
</table>

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(Cont'd) ..................
GENERAL DATA (Continued).

STEERING (Cont'd).

Track: Front
Disc wheels 47.1/2 in. (1.203 m.)
Wire wheels 47.7/8 in. (1.216 m.)
Disc wheels 48.3/4 in. (1.238 m.)
Wire wheels 48.3/4 in. (1.238 m.)

Rear

FRONT SUSPENSION

Type
Independent coil.

Spring detail:
To Car No. 15151
Coil diameter (Mean) 3.28 in. (82.24 mm)
Diameter of wire 4.98 in. (12.66 mm)
Free height 9.28 + 1/16 in. 8.88 + 1/16 in.
(23.49 cm ± 1.6 mm) (22.55 cm ± 1.6 mm)

Number of free coils 7.5
Static laden length 6.65 ± 1/32 in. (16.89 cm ± 0.3 mm)
Static laden length at load of 905 lb. (410.27 kg.)
Maximum deflection
Dampers (Front) 4 in. (10.16 cm).

REAR SUSPENSION

Type
Semi-elliptic.

Spring detail:
6.
Number of leaves 1.3/4 in. (44.45 mm)
Width of leaves 7/32 in. (5.56 m.m.)
Gauge 650 lb. (293.7 kg.)
Working load 3.60 in. (91.44 mm.)
Free camber
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) 31.3/8 in. (79.69 cm)
Overall length
1.23/32 in. (97.44 cm)
Diameter 2 in. (50.8 m.m.)

REAR AXLE

Make and Type
B.M.C. "B" type, three-quarter-floating.

Ratio: Standard
10 / 43
Optional
9 / 44
Adjustment
Shims

(Cont'd).............
GENERAL DATA (Continued)

ELECTRICAL EQUIPMENT.

System
Charging system
Battery
Starter Motor
Dynamo

12 volt. Positive earth.
Compensated voltage control
Two, 6 volt. Lucas S.G. 9.E.
Lucas 4 brush. M. 35. G.

BRAKES.

Type
Size
Front
Rear
Drum size
Lining dimensions
Lining area: Front
Rear
Material

Lockheed hydraulics (Front and rear)
10 in x 1.3/4 in (25.4 cm x 44.45 mm)
Two leading shoes,
Single leading shoe,
10 in. (Front and rear)
9.6 in x 1.3/4 in (24.38 cm x 44.45 mm)
57.2 sq. in (433.55 cm²)
57.2 sq. in (433.55 cm²)
Ferodo, D.M. 12.

WHEELS

Type: Ventilated Disc.
Wire (Optional)

4.5 J x 15
4.5 J x 15 and 48 spoke

TYRES

Size
Tyre pressures: Normal.
Fast motoring,
Competition work, and sustained
High speed motoring.

5.60 - 15
Front, 17 lb/sq. in. (1.2 kg/cm²)
Rear, 20 lb/sq. in. (1.4 kg/cm²)
Front, 21 lb/sq. in. (1.48 kg/cm²)
Rear, 24 lb/sq. in. (1.69 kg/cm²)
Front, 23 lb/sq. in. (1.62 kg/cm²)
Rear, 26 lb/sq. in. (1.83 kg/cm²)

CAPACITIES.

Engine Sump (Incl. Filter)
Gearbox
Rear Axle
Cooling system
Steering rack
Fuel tank
Brake system

Imp. U.S. Litres
7 pts. 8, 1/2 pts. 4.00
4 pts. 5 pts 2.27
2 3/4 pts. 3 1/4 pts. 1.56
10 pts. 12 pts. 5.67
1/2 pt. 6 pts. 0.28
10 gals. 12 gals. 45.4
1 pt. 1.2 pts. 0.568

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(Cont'd).............
GENERAL DIMENSIONS

Wheelbase
Overall length
Overall width
Overall height
Ground clearance

Weight: fully equipped with tools, spare wheel, oil, water, and 2 gallons of fuel (2.5 U.S., 9.1 litres) 1988 lb. (901.81 kg).
Turning circles

9\frac{1}{4} \text{ in.} \ (238.8 \text{ cm})
156 \text{ in.} \ (396.2 \text{ cm})
58 \text{ in.} \ (147.3 \text{ cm})
50 \text{ in.} \ (127.0 \text{ cm})
6 \text{ in.} \ (15.24 \text{ cm})

28 \text{ ft.} \ (8.534 \text{ metres})
Tuning by port polishing.

An increase of some 3 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 to Illustration S.K. 7092. Make up a sheet metal template to the dimensions given 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 on the same illustration, at the same time reducing the length of the exhaust valve guide and boss by 3/32" at the port end.

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 shows the peak of the combustion chamber ground slightly away to a 3/16" 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 5750 r.p.m.

It is sometimes found beneficial, but not essential, to fit the richer carburettor needles 'C.C.'.
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 Pt. No. 1.H. 603. (Standard M.G. Z.B. 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 $0.322"$ (8.1778 m.m.).

The standard distributor may be used but a distributor with correct advance curve for use with this camshaft is Pt. No. 1.H. 1036. (Standard M.G. Z.B. Magnette).

Ignition setting should be $4^\circ$ B.T.D.C. The tappet setting should be $0.015"$.

Top end performance will only be slightly impaired between 5000 and 6000 R.P.M.

If desired the head may be tuned by port polishing as laid down in Stage M.G.A. - 1.
Tuning for middle range with Higher Compression Ratio,

If increased middle range performance is required, carry out fitting of camshaft etc. as M.G.A. 2, and fit flat top pistons 9:0 to 1 ratio, Pt. No. 1.H.1178.

Ignition setting should range between 4° and 2° B.T.D.C.
Higher Compression Ratio Tuning. \( (2.0 \text{ to } 1.0) \).

Carry out the procedure for tuning by port polishing as Stage M.G.A. – 1.

The compression ratio is raised to \( 9.0 \) to \( 1 \) by fitting new flat top pistons:

- Part No. 1H1178. (Piston complete with rings and gudgeon pin).

Use N.5. Champion plugs, but N.3. may be required for hard driving.

Ignition setting should be approximately \( 4^\circ \) B.T.D.C.

Carburettor needles 'C.C.'

The engine should then give 78 - 80 brake horse power at 6000 R.P.M.
High Compression Ratio Tuning 10.1 to 1.

Carry out the procedure for port polishing as Stage M.G.A. - 1.

The compression ratio is raised to 10.1 to 1 by fitting special raised top pistons, Part No. IH.1108 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.

Also, grind away the point on each combustion space as Illustration below, SK.7092, 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 1/16" 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 above pistons have fully floating gudgeon pins of diameter increased to 7/32", and will require new connecting rods:

\[
\begin{align*}
2 \text{ off Pt. No. AEH.431,} & \quad ) \quad \text{Use in balanced sets.} \\
2 \text{ off Pt. No. AEH.433,} & \quad \}
\end{align*}
\]

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.


Ignition setting 2° B.T.D.C.

Carburetter Needles, 'C.C.'

The engine then gives 86 Brake Horse Power at 6000 R.P.M.
Stage M.G.A. - 4A

Tuning with High Compression Ratio 10:1 to 1 and larger carburetters.

Tune engine as procedure for Stage M.G.A. - 4.

Fit 1.3/4" dia. S. U. Carburetters, Pt. No. AUC.780, these are fitted with .100 jets and K.W. Needles. Alternative needles, Richer R.P., Weaker K.W.L.

A new inlet manifold Pt. No. AEH.200 will be required. This manifold has a 5/6" dia. bypass hole in the balance pipe.

Polish this manifold as explained in Stage M.G.A. - 1.

To prevent vibration of the carburetters, it is advisable to use a Synthetic Rubber Gasket (Pt. No. AHH.5791.) between the carburetters and the manifold, and a 1/8" 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 1.13/16" dia. and fixing nuts and vent holes altered to match the 1.3/4" carburetter flange. These carburetters will not give a large improvement, but the engine should give about 88 Brake Horse Power at 6000 R.P.M.
Valves.

If an exhaust valve is desired with a longer service life, or more resistant to burning, Valves No. 1.M. 1025, 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 pitter, especially at speeds around 70 M.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 rechecking 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.
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 grill, as depicted in the Illustration 3.K. 7139.

Clutch.

Up to Engine No. 16225 the clutches were fitted with pressure springs Pt. No. 3.H. 2914 (Black and Yellow marking), 165/175 lbs. 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 Pt. No. 1.H. 1024 (Cream and Green marking), 180/190 lbs. load can be fitted.

All engines after 16225 are fitted with the 180/190 lbs. 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, Pt. No. 4.H. 5457, 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.

<table>
<thead>
<tr>
<th>Champion</th>
<th>Lodge</th>
<th>K.L.G.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.5</td>
<td>H.L.N.</td>
<td>F.E. 70</td>
</tr>
<tr>
<td>N.3</td>
<td>3. H.L.N.</td>
<td>F.E. 100</td>
</tr>
</tbody>
</table>

Note: - Previous designation of Champion Plugs was N.A. 8 for N.5. and N.A. 10 for N.3.

Some arduous conditions may call for sparking plugs in the Racing range such as Champion N. 58.R. was N.A. 12, Lodge R.L. 47, or K.L.G. F.E. 220.

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

Close ratio gears are available giving gearbox ratios of:

3rd. 1.268 to 1,  2nd. 1.62 to 1.  1st. 2.45 to 1.

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

<table>
<thead>
<tr>
<th>Part No.</th>
<th>1st. Motion Shaft</th>
<th>1st. Motion Shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.H. 3297</td>
<td>1 off.</td>
<td>1 off.</td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>1.H. 3298</td>
<td>Laygear.</td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>1.H. 3299</td>
<td>2nd. Speed Mainshaft Gear</td>
</tr>
<tr>
<td>&quot; &quot;</td>
<td>1.H. 3300</td>
<td>3rd. Speed Mainshaft Gear</td>
</tr>
</tbody>
</table>

Rear Axle Ratios.

With the combination of the 4.55, 4.3, 4.1 and 3.9 to 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.

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.

Petrol 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 or more gal can.

Switch on the pump and check time for 1 gal to flow.

The Standard engine uses a maximum of approx. 5.7 gals. an hour, and the engine tuned to Stage A.A. uses approx. 7 gals. an hour.

A good pump may flow 9 gals. an hour, but a pump needing attention may only flow 6 gals. an hour.

If a pump is required which will give a flow with a wide safety margin 'S.U.' fuel pump, Pt. No. A.U.A. 73 is available.

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

The valve bounce R.P.M. on the standard engine is 6000 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 6300/6400 R.P.M., then Outer Springs Pt. No. 1.H. 1111, and Inner Valve Springs Pt. No. 1.H. 1112 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 horse power, 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.
Exhaust Valve (High Duty)

Oil Cooler (Kit)
(see Illustration SK.7139 for fitting)

Brake Shoe Lined Assembly
(Lined with Ferodo VG 95/1 Competition facings).

Brake Linings (VG 95/1) and Rivets (1 set)

Bonnet Straps and plates (1 pair)

Wire Wheels (60 spoke with 4½" Alum Alloy
rims 15" dia.)

Wire Wheels (60 spoke with 4½" Steel rims (15" dia.)

Competition Clutch Assembly
(Extra High Duty).

Crown Wheel and Pinion,
(10/41) 4.1 to 1 ratio.

Speedometer for 4.1 ratio M.P.H.

Speedometer for 4.1 ratio K.P.H.

Crown Wheel and Pinion,
(11/43) 3.9 to 1 ratio.

Speedometer for 3.9 ratio M.P.H.

Speedometer for 3.9 ratio K.P.H.

Crown Wheel and Pinion,
(9/41) 4.55 to 1 ratio.

Speedometer for 4.55 ratio M.P.H.

Speedometer for 4.55 ratio K.P.H.

Piston (Complete with rings and gudgeon pins)
Flat Top 9.0 to 1 ratio.

Piston Complete, Raised Head 10.1 to 1 ratio.
(Including rings, Piston LH.1109 and Gudgeon pin LH.1110.)

Connecting Rods (for use with 10.1 to 1 pistons
having fully floating gudgeon pins)

Carburetters 1½" dia. (1 pair)

Inlet Manifold for 1½" dia. Carburetters.

1st Motion Shaft.

Laygear

2nd. Speed Mainshaft Gear.

3rd. Speed Mainshaft Gear.

Valve Springs - Outer
(See Special Note
under Valve Springs)

Valve Springs - Inner

Synthetic Rubber Gasket. (for 1½" Carbs.)

Part No.
1H.1025.
AH.0088.
AH.5603.
AH.5604.
AH.5518/9.
AH.8000.
AH.8001.
AH.5457.
ATB.7240 (Pair)
BE.4060.
BE.4061.
ATB.7236 (Pair)
BE.4068.
BE.4069.
ATB.7146.
LH.295.
LH.296.
LH.1178.
LH.1108.
AEH.431. R.H. (2 & 4)
AEH.433. L.H. (1 & 3)
AUC.780.
AEH.200.
LH.3297.
LH.3298.
LH.3299.
LH.3300.
LH.1111.
LH.1112.
AH.5791.
List of Special Accessories available.

Sliding Side Screens

'Ace' Mercury wheel discs (Set 4.)

Rimbellishers (Set 5.)

Badge Bar

Fog Lamp

Bracket for Fog Lamp or

Twin Horns (High Note)

Heater Kit

Radiator Blind

Overall Tonneau Cover

Luggage Carrier

Adjustable Steering Column

Tyres, Road Speed 5.90 x 15

Radio (Kit) 'Radiomobile'

Windscreen Washer (Kit)

Ash Tray (Tunnel Mounting)

Cold Air Ventilation (Kit)

Wing Mirrors

Competition full width windsreen
(Aluminium & Perspex)

Cigar Lighter o/w Leads.
(Casco Tex)

Steering Wheel
(Wood rim, light alloy, Italian Style.)

Cylinder Head Assembly.

Complete with :-
(Valves,
Springs.
)
(Exhaust and Inlet Manifold
(Studs, Nuts, and Gaskets fitted

Part No.

AHH 5731. R.H.

AHH 5732. L.H.

97H. 676. R.H.

97H. 675. L.H.

AHH 8002.

AHH 5565

ADH 785.

AHH 5521. R.H.

AHH 5520. L.H.

ACG 5238.

AHH 5422.

AHH 5536.

AHF 2626. R.H.D.

AHF 2628. L.H.D.

AHH 5495.

AHH 6012.

AHH 5523.

AHH 5683.

AHH 5539.

AHH 5532

BHA 4066. R.H. or L.H.

Wing.

AHF 2591.

AHH 5759.

AHH 5800.

1.H. 1159. )Polished ports
and matched
manifolds by
Laystall Eng.
Co. Ltd.,

and supplied
as a complete
unit.